المحاضرة الثامنة

STAR Exercise 1A

الغرض
- لاستعراض ونقل المعلومات من المكتبات الى القطع الالكترونية المنتخبة
- لفحص الحمايات والتنسيق بينها عن طريق توليد منحنيات التيار-الزمن TCC Tiem current Curve
- استعراض منحنيات STAR TCC وخصائصها

Purpose
1. To navigate and retrieve data from each library into respective devices
2. To test the protection and coordination settings of this system by generating TCCs
3. Demonstrate STAR TCC Features

الطريقة
- افتح التمرين star_Excercise 1
- انشئ مخطط النظام
- ادخل معلومات العناصر الكهربائية كما مبين ادناه

Procedure
1. Open project STAR_Exercise1A
2. Create the One-line Diagram for the system
3. Input data for the elements shown below

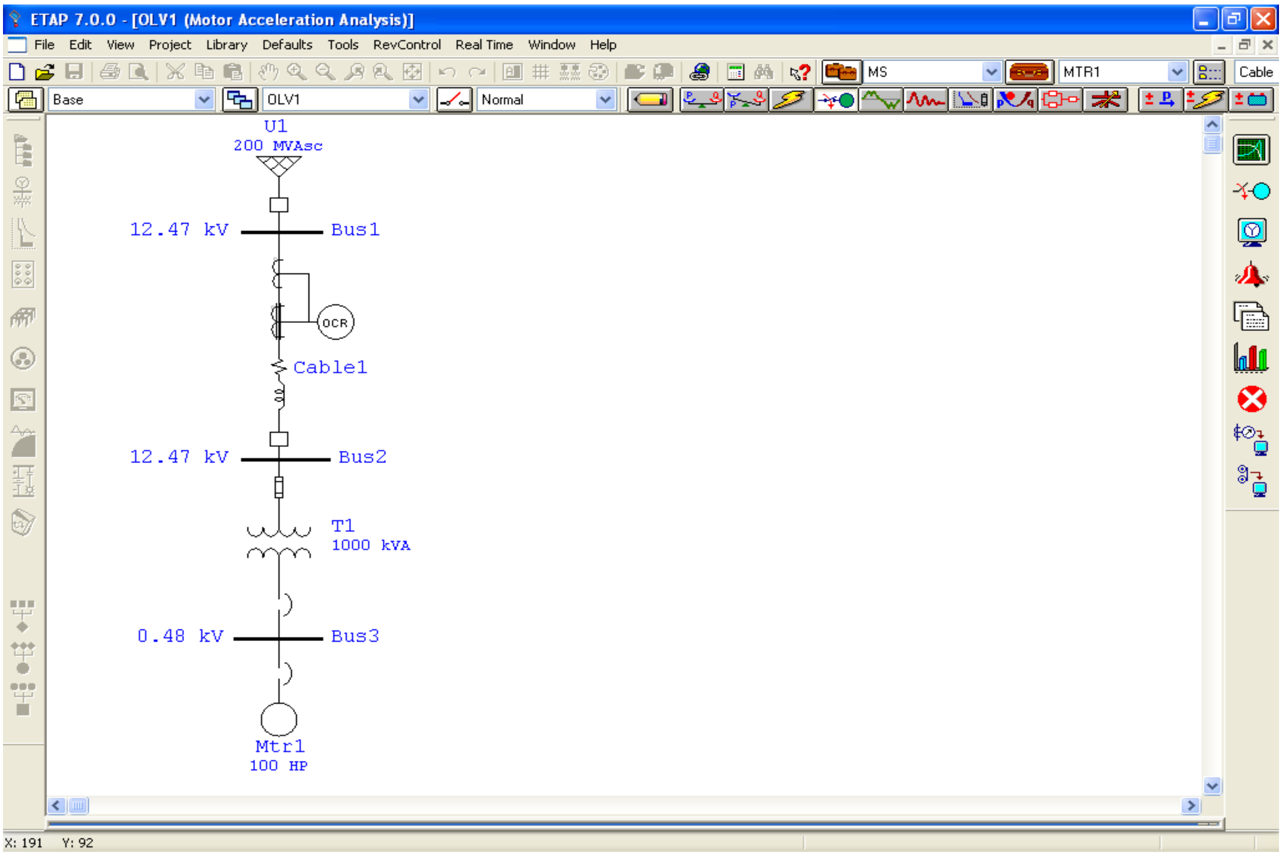

ETAP 7.0.0 - [OLV1 (Motor Acceleration Analysis)]
File
Edit
View
Project
Library
Defaults
Tools
RevControl
Real Time
Window
Help
MS
MTR1
Cable
Base
OLV1
Normal
U1
200 MVAsc
12.47 kV
Bus1
OCR
Cable1
12.47 kV
Bus2
T1
1000 kVA
0.48 kV
Bus3
Mtr1
100 HP
X: 191
Y: 92

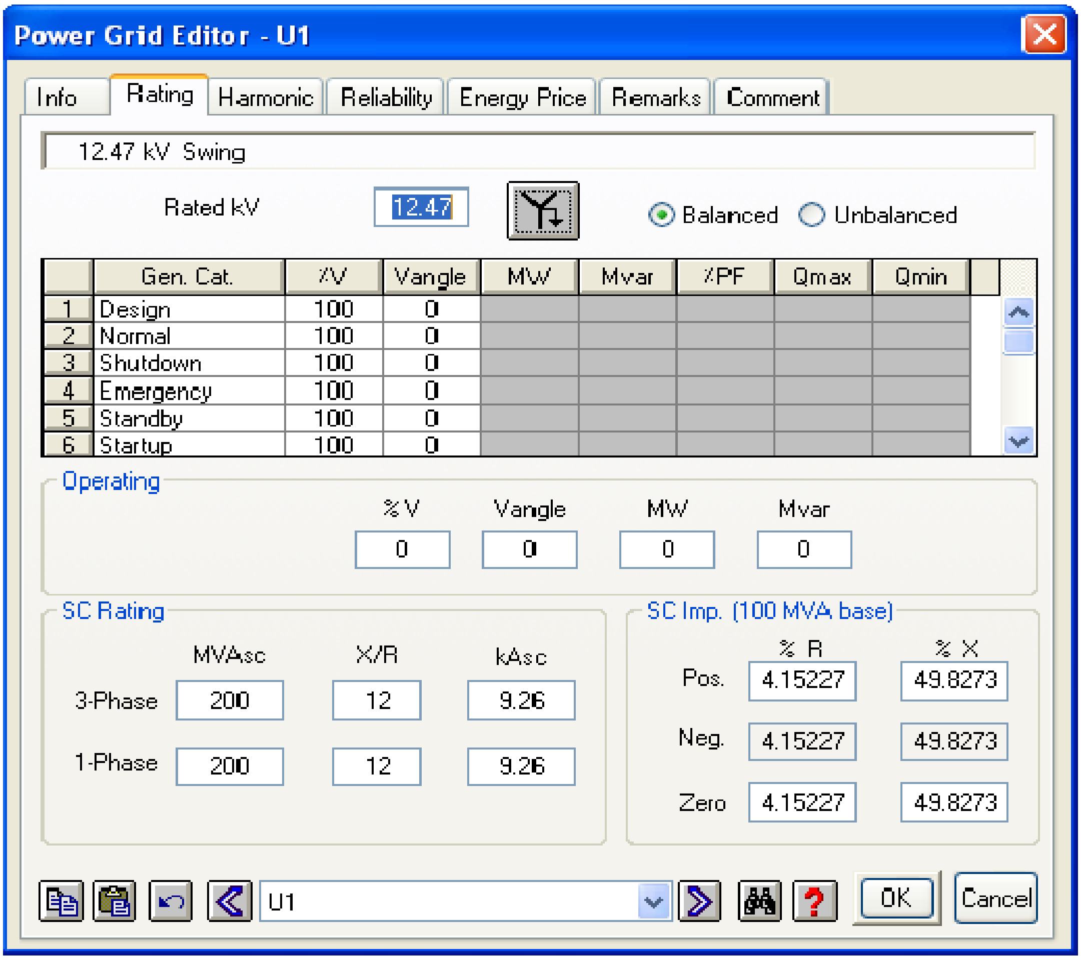
Fig 8-1

انقر مرتين على المصدر لفتح المحرر كما مبين ادناه

Double click to open the utility editor as shown below.

تاكد من القيم ثم انقر موافق

ensure ratings and clik OK



Power Grid Editor - U1

12.47 kV Swing

Rated kV 12.47

● Balanced ○ Unbalanced

	Gen. Cat.	%V	Vangle	MW	Mvar	%PF	Qmax	Qmin
1	Design	100	0					
2	Normal	100	0					
3	Shutdown	100	0					
4	Emergency	100	0					
5	Standby	100	0					
6	Startup	100	0					

Operating

%V	Vangle	MW	Mvar
0	0	0	0

SC Rating

	MVAsc	X/R	kAsc
3-Phase	200	12	9.26
1-Phase	200	12	9.26

SC Imp. (100 MVA base)

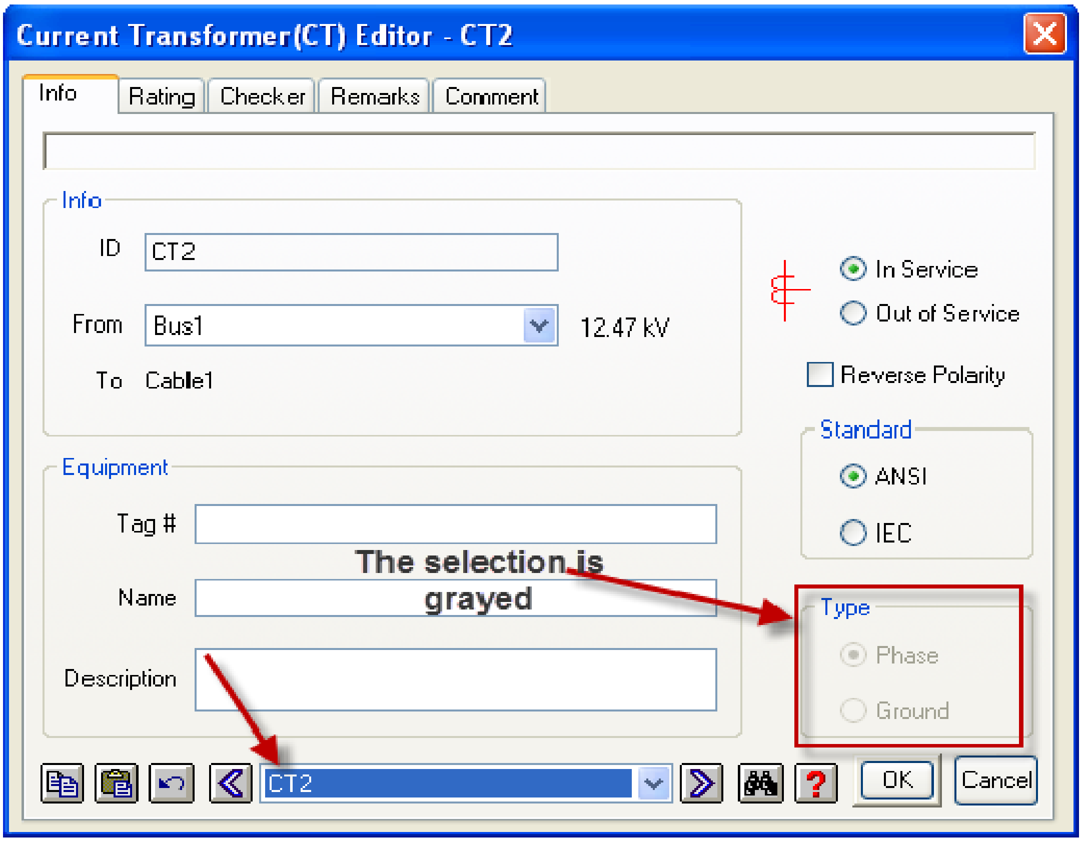
	% R	% X
Pos.	4.15227	49.8273
Neg.	4.15227	49.8273
Zero	4.15227	49.8273

U1

Fig 8-2

افتح محرر محولات التيار بنقر مزدوج على واحدة منها كما مبين ادناه

Click on one of the current transformers to open its editor as shown belowl


Current Transformer(CT) Editor - CT2
Info
Rating
Checker
Remarks
Comment
Equipment
Tag #
Name
Description
OK
Cancel

Info
ID: CT2
From: Bus1 12.47 kV
To: Cable1

● In Service
○ Out of Service
☐ Reverse Polarity

Standard
● ANSI
○ IEC

Type
● Phase
○ Ground

CT2

The selection is grayed

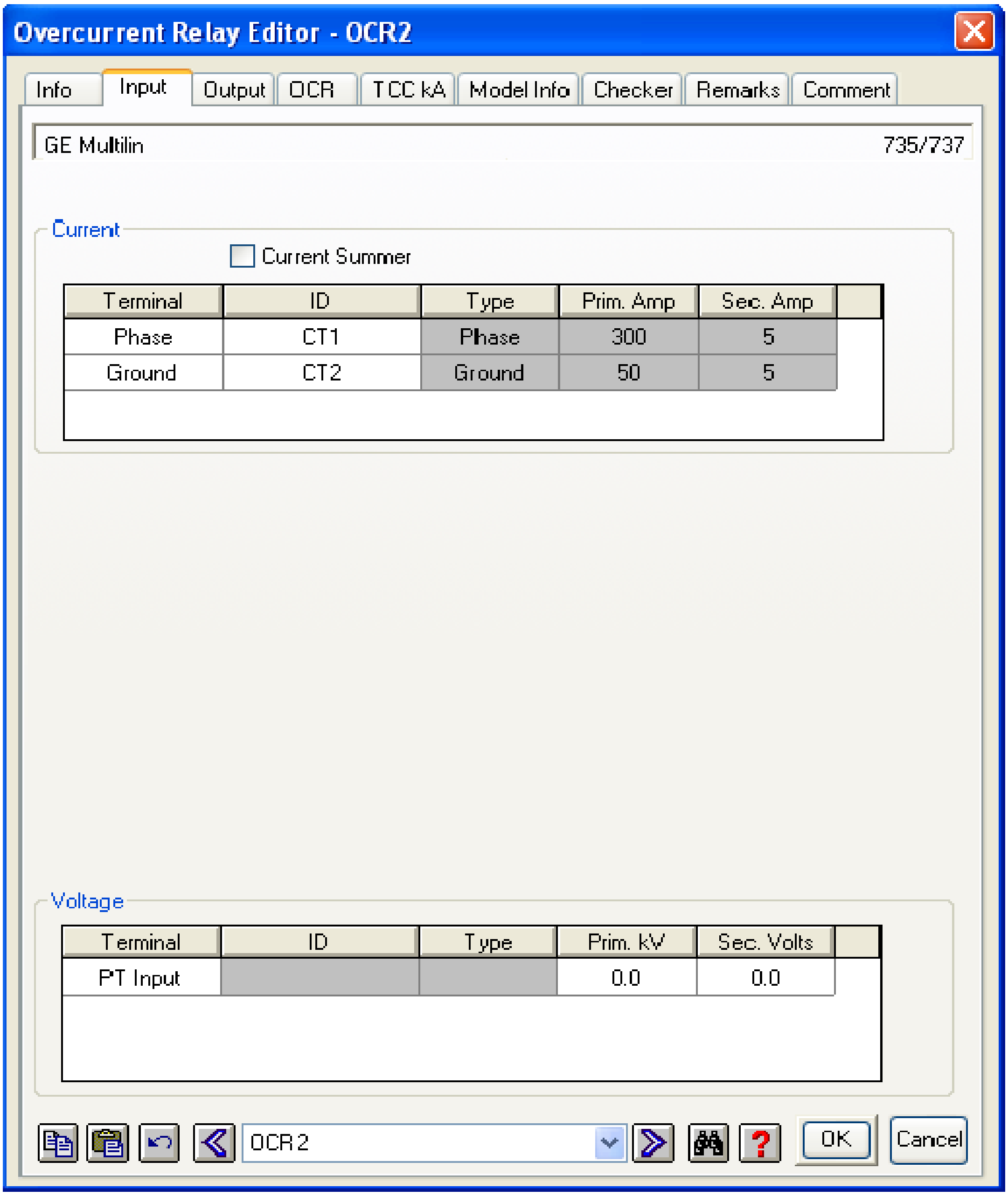
Fig 8-3

انتقل الى محرر المحول CT2 ولاحظ ان اختيار نوع المحول مقفل كماميين اعلاه ثم انقر موافق

Navigate to CT2 editor and note that for both transformers the type is grayed, click OK

افتح المحرر الخاص بالمرحل OCR2كما مبين ادناه

Open OCR2 editor as shown below.


Overcurrent Relay Editor - OCR2
Info
Input
Output
OCR
TCC kA
Model Info
Checker
Remarks
Comment
OK
Cancel

GE Multilin 735/737

Current

☐ Current Summer

Terminal	ID	Type	Prim. Amp	Sec. Amp
Phase	CT1	Phase	300	5
Ground	CT2	Ground	50	5

Voltage

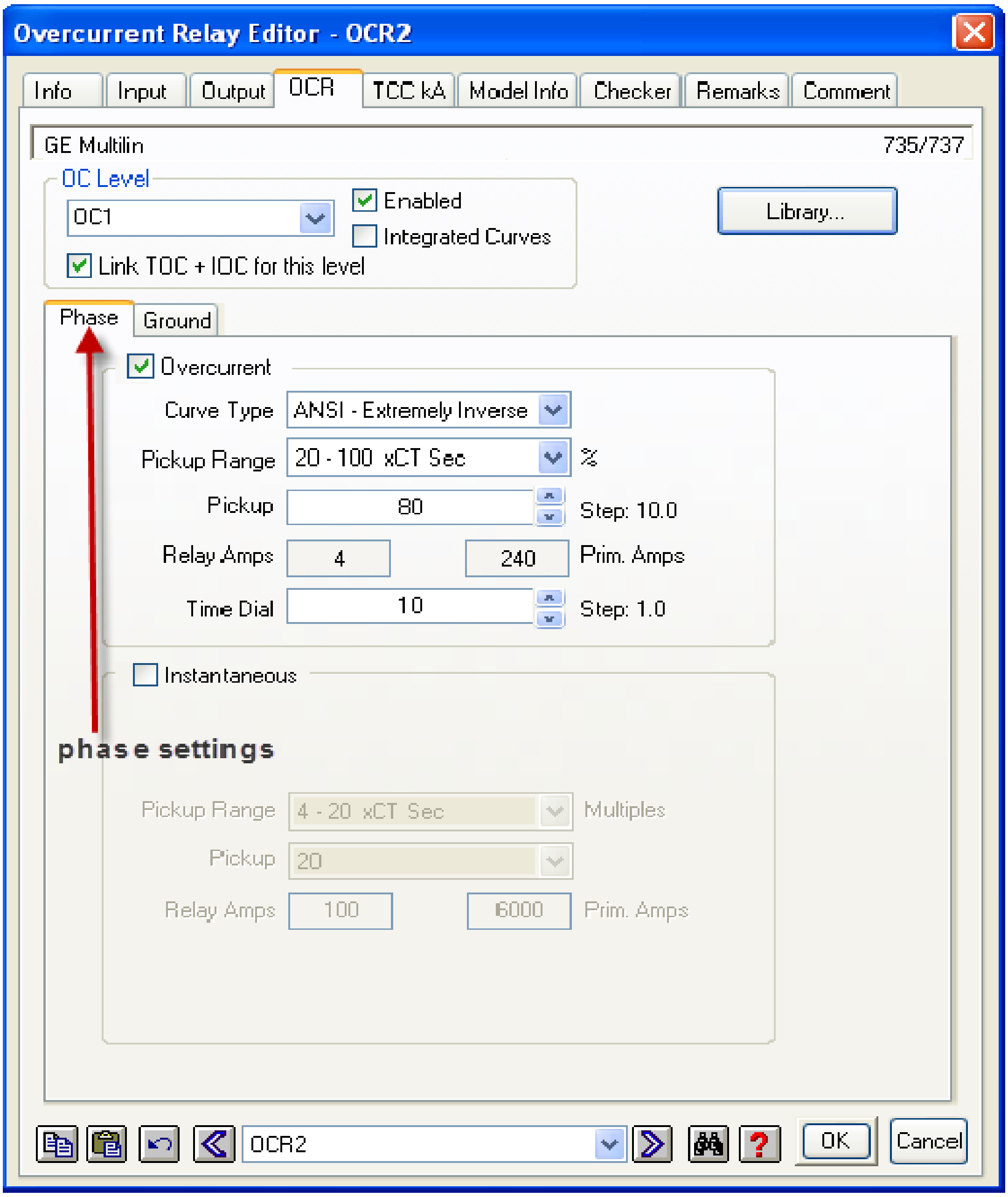
Terminal	ID	Type	Prim. kV	Sec. Volts
PT Input			0.0	0.0

OCR2

Fig 8-4

اذهب الى صفحة OCR كما مبين ادناه ثم تاكد من صفحة (الطور)

navigate to OCR tab as shown below and check the phse TAB


Info
Input
Output
OCR
TCC kA
Model Info
Checker
Remarks
Comment
Library...
phase settings
OK
Cancel

Overcurrent Relay Editor - OCR2

GE Multilin 735/737

OC Level: OC1

☑ Enabled

☐ Integrated Curves

☑ Link TOC + IOC for this level

Phase | Ground

☑ Overcurrent

Curve Type: ANSI - Extremely Inverse

Pickup Range: 20 - 100 xCT Sec %

Pickup: 80 Step: 10.0

Relay Amps: 4 240 Prim. Amps

Time Dial: 10 Step: 1.0

☐ Instantaneous

Pickup Range: 4 - 20 xCT Sec Multiples

Pickup: 20

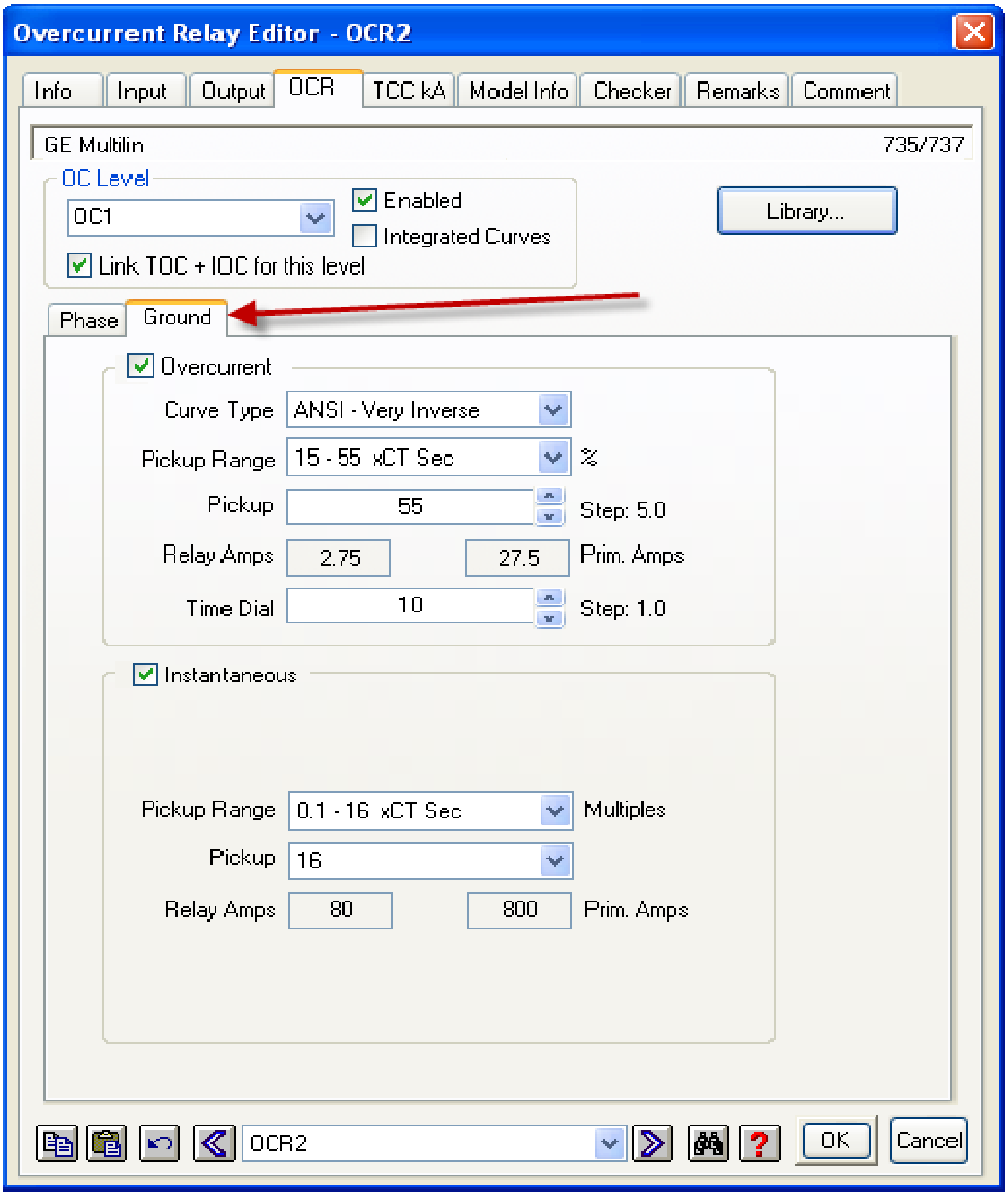
Relay Amps: 100 6000 Prim. Amps

OCR2

Fig 8-5

انتقل الى صفحة الارضي كما مبين ادناه ثم انقر موافق للاغلاق

Check ground settings as shown below then click OK to close the editor


Overcurrent Relay Editor - OCR2
Info
Input
Output
OCR
TCC kA
Model Info
Checker
Remarks
Comment
Library...
Phase
Ground
OK
Cancel

GE Multilin 735/737

OC Level: OC1

☑ Enabled

☐ Integrated Curves

☑ Link TOC + IOC for this level

☑ Overcurrent

Curve Type: ANSI - Very Inverse

Pickup Range: 15 - 55 xCT Sec %

Pickup: 55 Step: 5.0

Relay Amps: 2.75 27.5 Prim. Amps

Time Dial: 10 Step: 1.0

☑ Instantaneous

Pickup Range: 0.1 - 16 xCT Sec Multiples

Pickup: 16

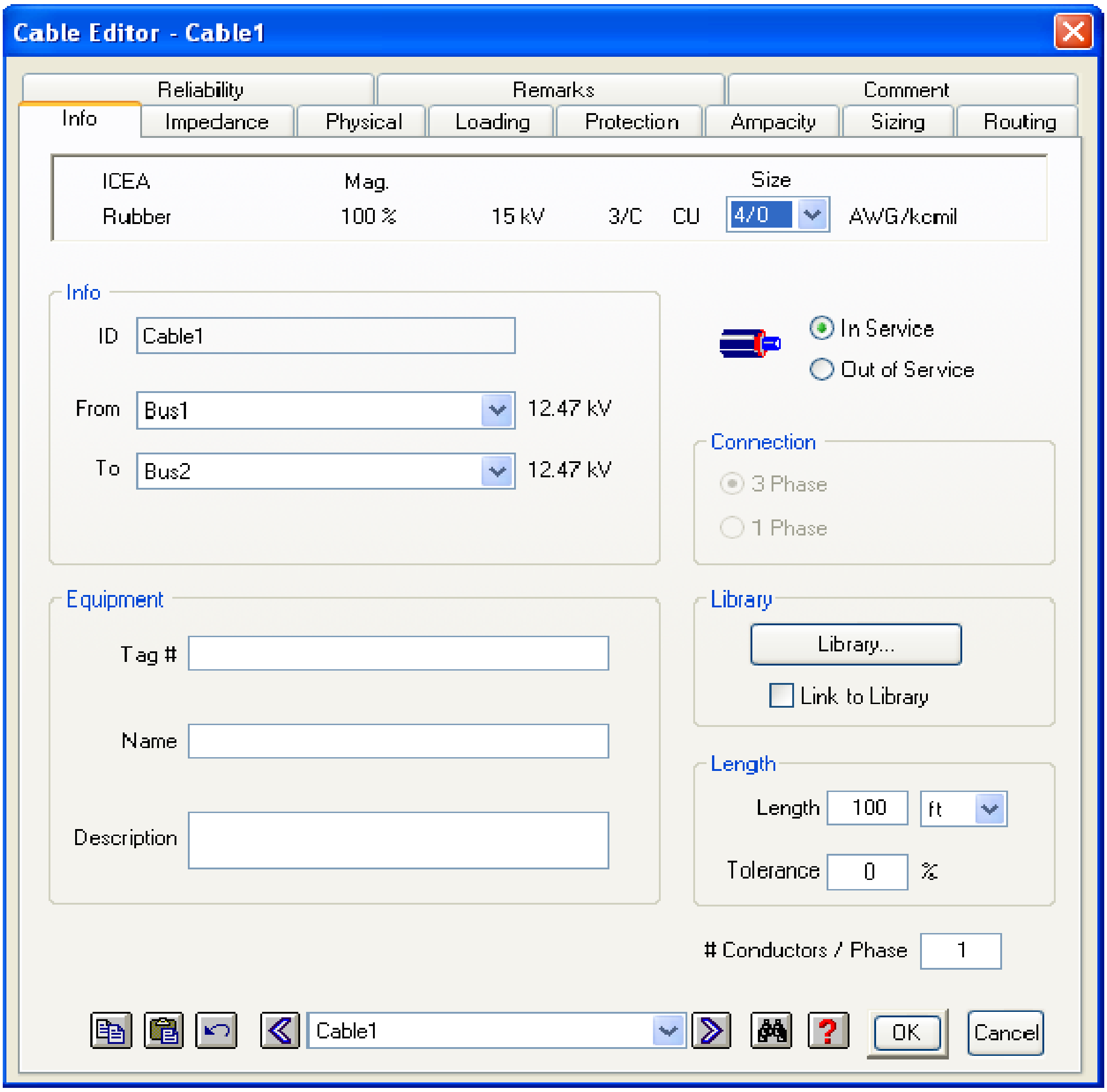
Relay Amps: 80 800 Prim. Amps

OCR2

Fig 8-6

افتح محرر الكابل تاكد من القيم المدخلة ثم انقر موافق

Opent the cable editor as shown below, check inputs then click OK



Cable Editor - Cable1

ICEA Rubber, Mag. 100 %, 15 kV, 3/C, CU, Size 4/0 AWG/kcmil

Info
ID Cable1
From Bus1 12.47 kV
To Bus2 12.47 kV

● In Service
○ Out of Service

Connection
● 3 Phase
○ 1 Phase

Equipment
Tag #
Name
Description

Library
☐ Link to Library

Length
Length 100 ft
Tolerance 0 %

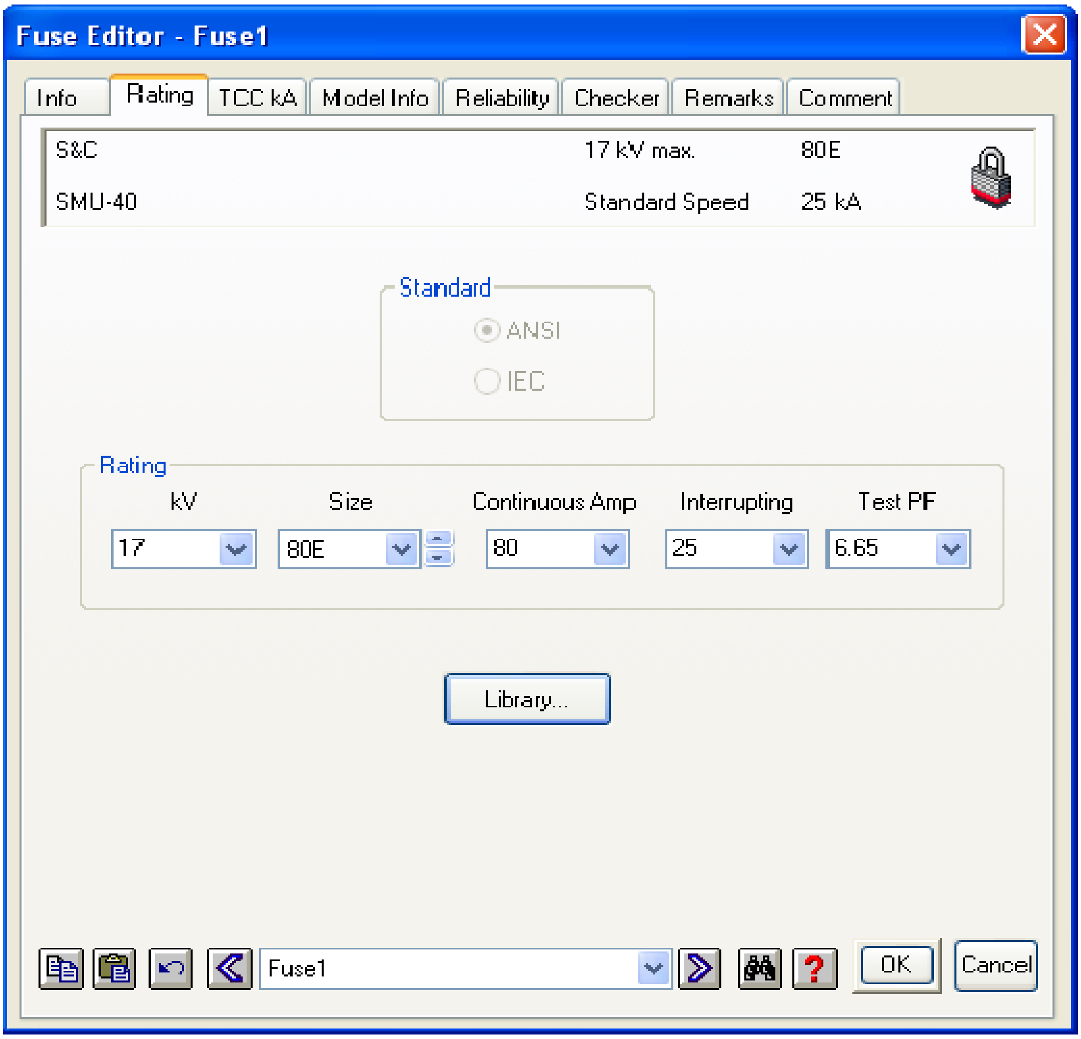
Conductors / Phase 1

Reliability
Remarks
Comment
Info
Impedance
Physical
Loading
Protection
Ampacity
Sizing
Routing
Library...
Cable1
OK
Cancel

Fig 8-7

افتح محرر المنصهر وتاكد من القيم المدخلة ثم انقر موافق كما مبين ادناه

Open fuse editor and check the inputs then click OK as shown below


Fuse Editor - Fuse1
Info
Rating
TCC kA
Model Info
Reliability
Checker
Remarks
Comment
Library...
OK
Cancel

S&C 17 kV max. 80E

SMU-40 Standard Speed 25 kA

Standard: ● ANSI ○ IEC

Rating

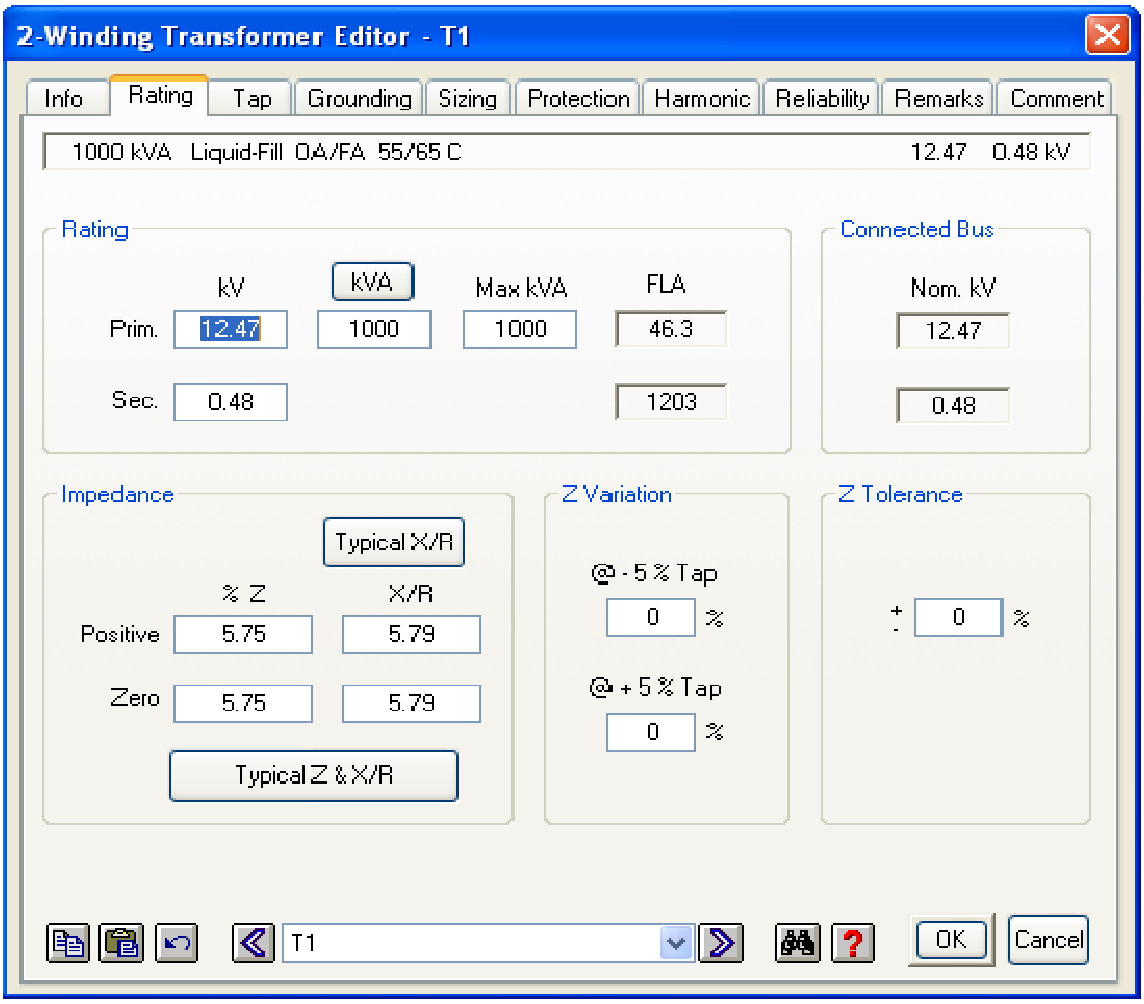
kV	Size	Continuous Amp	Interrupting	Test PF
17	80E	80	25	6.65

Fuse1

Fig 8-8

افتح محرر المحول وتاكد من القيم المدخلة ثم انقر موافق كما مبين ادناه

Open Transformer editor and check the inputs then click OK as shown below



2-Winding Transformer Editor - T1

Info
Rating
Tap
Grounding
Sizing
Protection
Harmonic
Reliability
Remarks
Comment

1000 kVA Liquid-Fill OA/FA 55/65 C 12.47 0.48 kV

Rating

	kV	kVA	Max kVA	FLA
Prim.	12.47	1000	1000	46.3
Sec.	0.48			1203

Connected Bus

Nom. kV: 12.47, 0.48

Impedance

	% Z	X/R
Positive	5.75	5.79
Zero	5.75	5.79

Z Variation

@ - 5 % Tap: 0 %

@ + 5 % Tap: 0 %

Z Tolerance

± 0 %

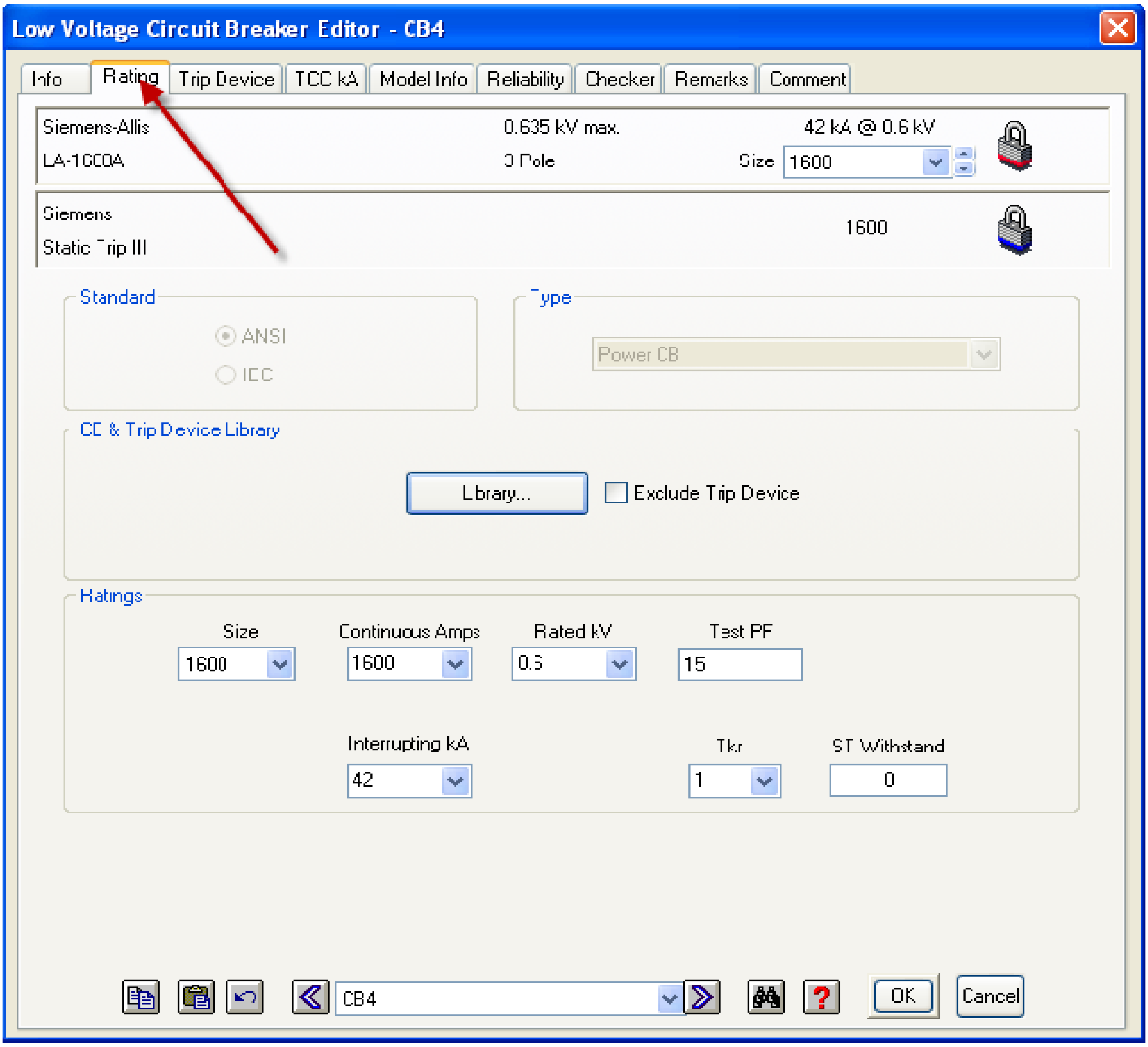
T1

Typical X/R
Typical Z & X/R
OK
Cancel

Fig 8-9

افتح محرر قاطع الضغط الواطئ وتاكد من القيم المدخلة كما مبين ادناه

Open low voltage circuit breaker (LVCB) editor and check the inputs as shown below


Low Voltage Circuit Breaker Editor - CB4
Info
Rating
Trip Device
TCC kA
Model Info
Reliability
Checker
Remarks
Comment
Library...
OK
Cancel

Siemens-Allis
LA-1600A
0.635 kV max.
3 Pole
42 kA @ 0.6 kV
Size 1600

Siemens
Static Trip III
1600

Standard
● ANSI
○ IEC

Type
Power CB

CB & Trip Device Library
☐ Exclude Trip Device

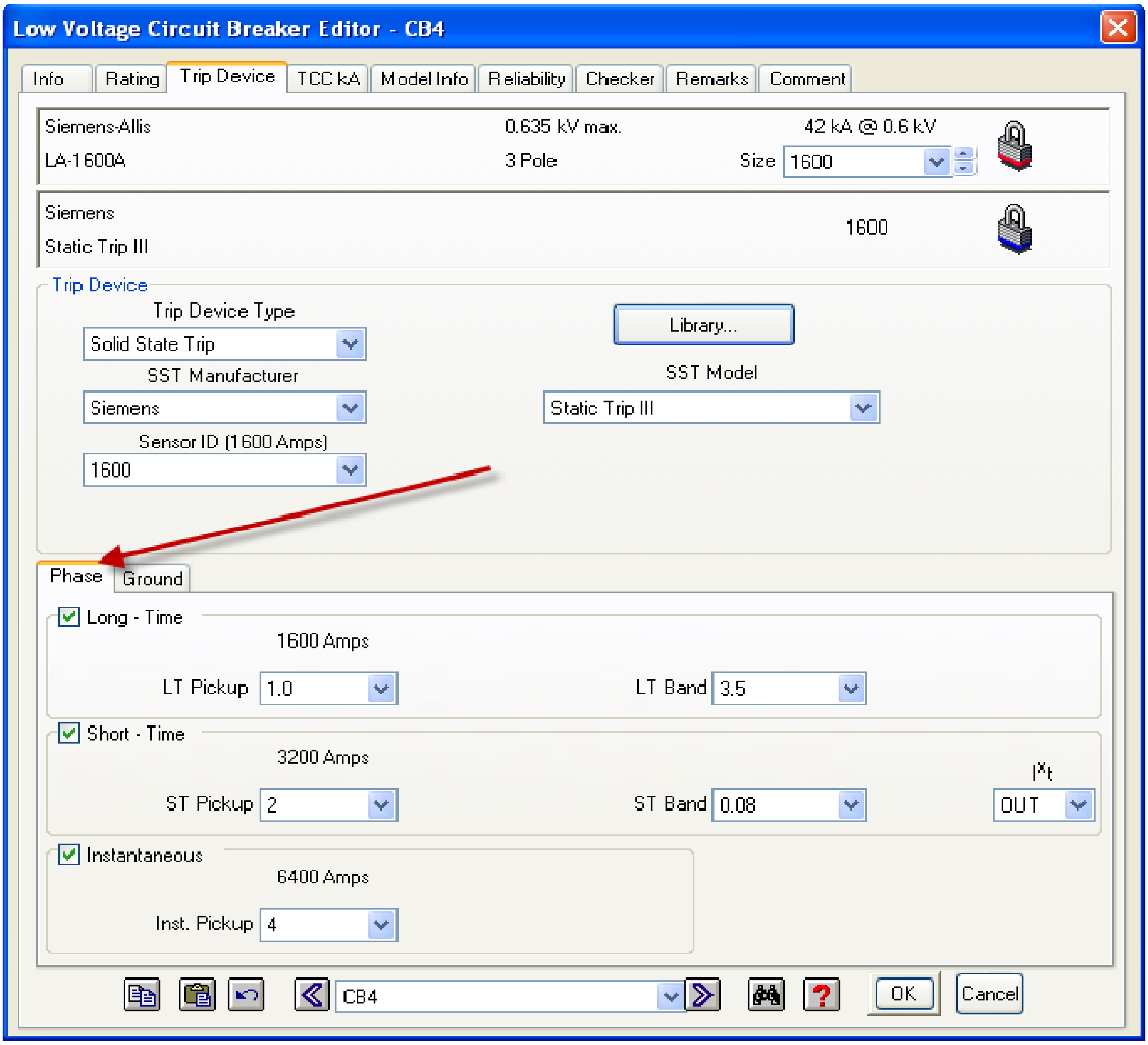
Ratings
Size: 1600
Continuous Amps: 1600
Rated kV: 0.6
Test PF: 15
Interrupting kA: 42
Tkr: 1
ST Withstand: 0

CB4

Fig 8-10

انتقل الى صفحة معدات القطع كما مبين ادناه

Go to trip device TAB as shown below.



Low Voltage Circuit Breaker Editor - CB4

Siemens-Allis — 0.635 kV max. — 42 kA @ 0.6 kV
LA-1600A — 3 Pole — Size 1600

Siemens — 1600
Static Trip III

Trip Device

Trip Device Type: Solid State Trip
SST Manufacturer: Siemens
SST Model: Static Trip III
Sensor ID (1600 Amps): 1600

Phase

☑ Long - Time — 1600 Amps
LT Pickup: 1.0
LT Band: 3.5

☑ Short - Time — 3200 Amps
ST Pickup: 2
ST Band: 0.08
I^2t: OUT

☑ Instantaneous — 6400 Amps
Inst. Pickup: 4

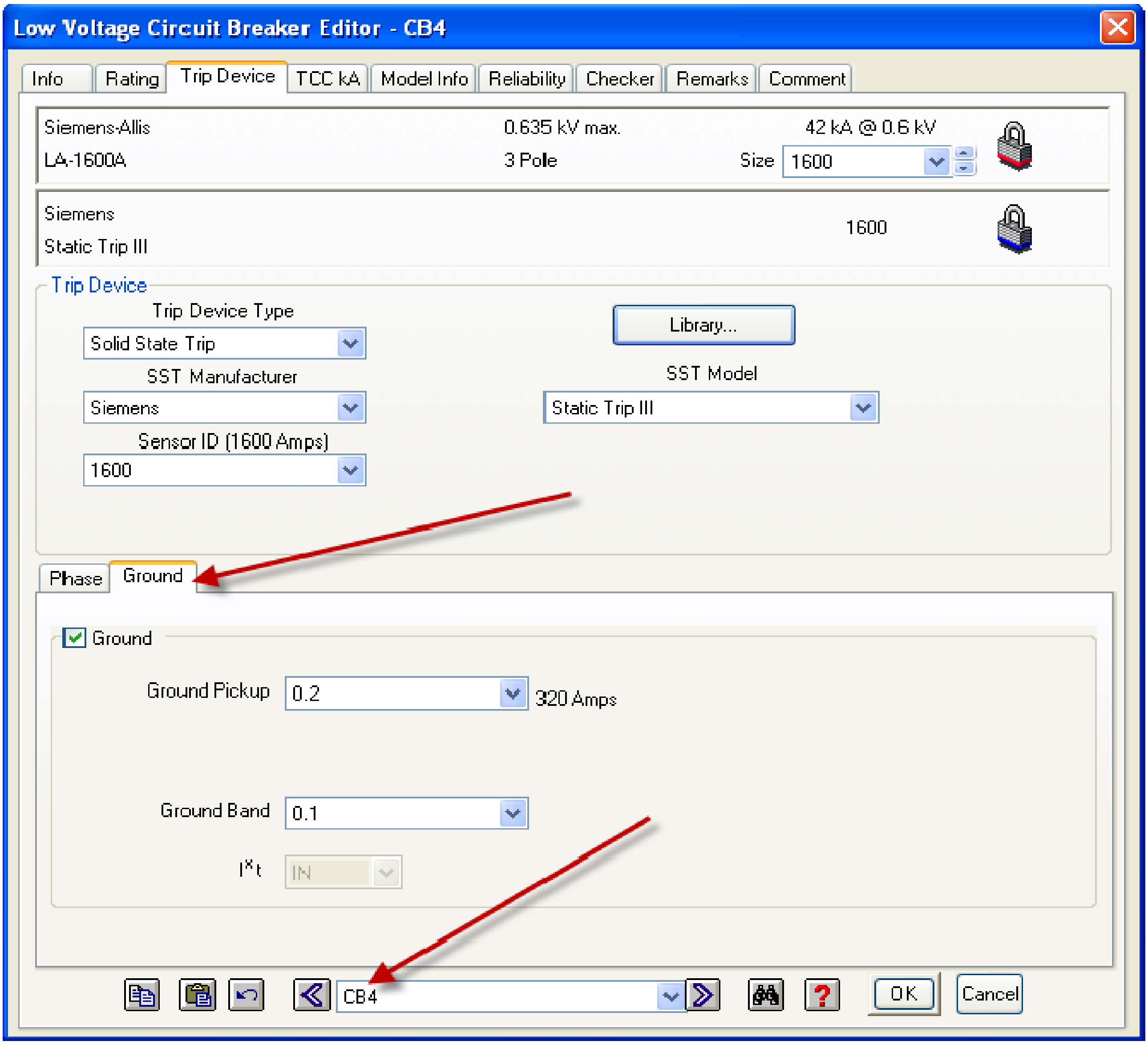
CB4

Info
Rating
Trip Device
TCC kA
Model Info
Reliability
Checker
Remarks
Comment
Library...
Phase
Ground
OK
Cancel

Fig 8-11

انتقل في نفس الصفحة الى الصفحة الفرعية الخاصة بالارضي كما مبين ادناه

Go to the ground TAB in the same trip device TAB as shown Below



Low Voltage Circuit Breaker Editor - CB4

Info
Rating
Trip Device
TCC kA
Model Info
Reliability
Checker
Remarks
Comment

Siemens-Allis
LA-1600A
0.635 kV max.
3 Pole
42 kA @ 0.6 kV
Size 1600

Siemens
Static Trip III
1600

Trip Device

Trip Device Type: Solid State Trip
SST Manufacturer: Siemens
Sensor ID (1600 Amps): 1600
SST Model: Static Trip III

Library...
Phase
Ground

☑ Ground

Ground Pickup: 0.2 320 Amps
Ground Band: 0.1
$I^x t$: IN

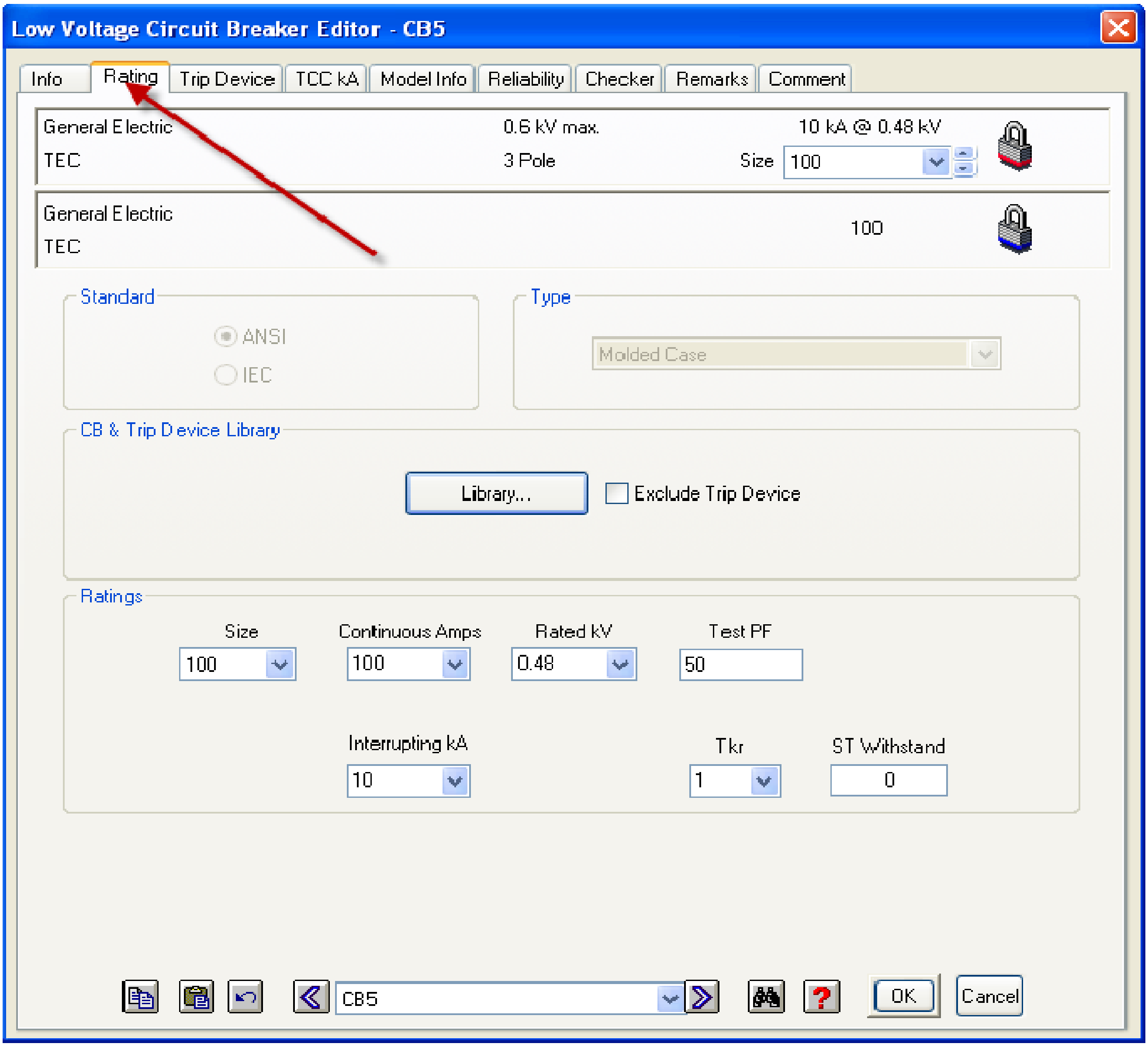
CB4

OK
Cancel

Fig 8-12

غير ال محرر الى قاطع CB5 كما مؤشر بالسهم اعلاه . انظر الشكل ادناه

Change the circuit breaker to CB5 as shown in the arrow above. Seet the figure below


Info
Rating
Trip Device
TCC kA
Model Info
Reliability
Checker
Remarks
Comment
Library...
OK
Cancel

Low Voltage Circuit Breaker Editor - CB5

General Electric
TEC
0.6 kV max.
3 Pole
10 kA @ 0.48 kV
Size 100

General Electric
TEC
100

Standard
● ANSI
○ IEC

Type
Molded Case

CB & Trip Device Library
☐ Exclude Trip Device

Ratings

Size	Continuous Amps	Rated kV	Test PF
100	100	0.48	50

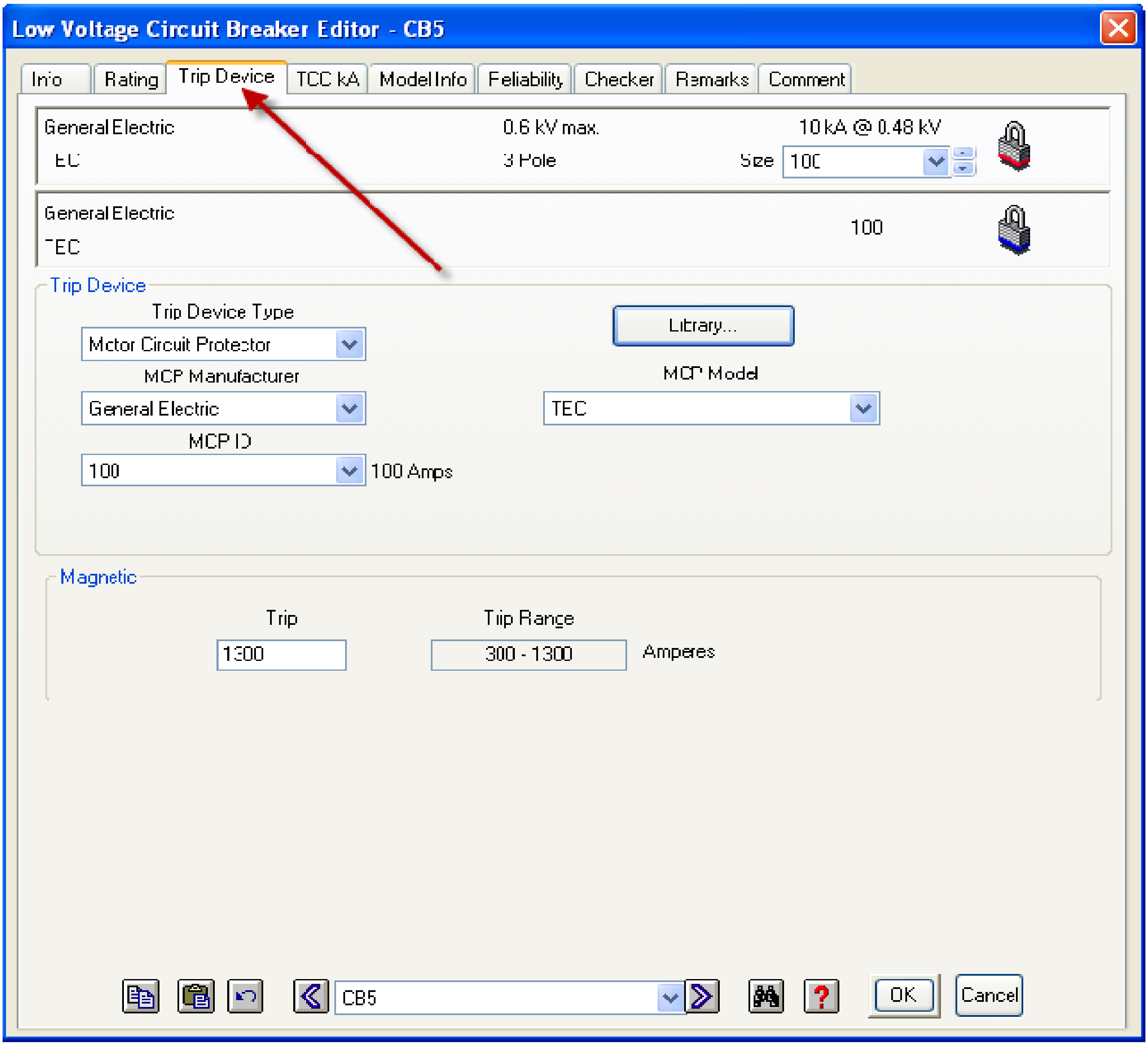
Interrupting kA	Tkr	ST Withstand
10	1	0

CB5

Fig 8-13

انتقل الى صفحة معدات القطع كما مبين ادناه
انقر موافق

Go to trip device TAB as shown below.
click OK



Low Voltage Circuit Breaker Editor - CB5
Info
Rating
Trip Device
TCC kA
Model Info
Reliability
Checker
Remarks
Comment
Library...
OK
Cancel

General Electric | 0.6 kV max. | 10 kA @ 0.48 kV
EC | 3 Pole | Size 100

General Electric | 100
TEC

Trip Device

Trip Device Type: Motor Circuit Protector

MCP Manufacturer: General Electric

MCP Model: TEC

MCP ID: 100 — 100 Amps

Magnetic

Trip: 1300

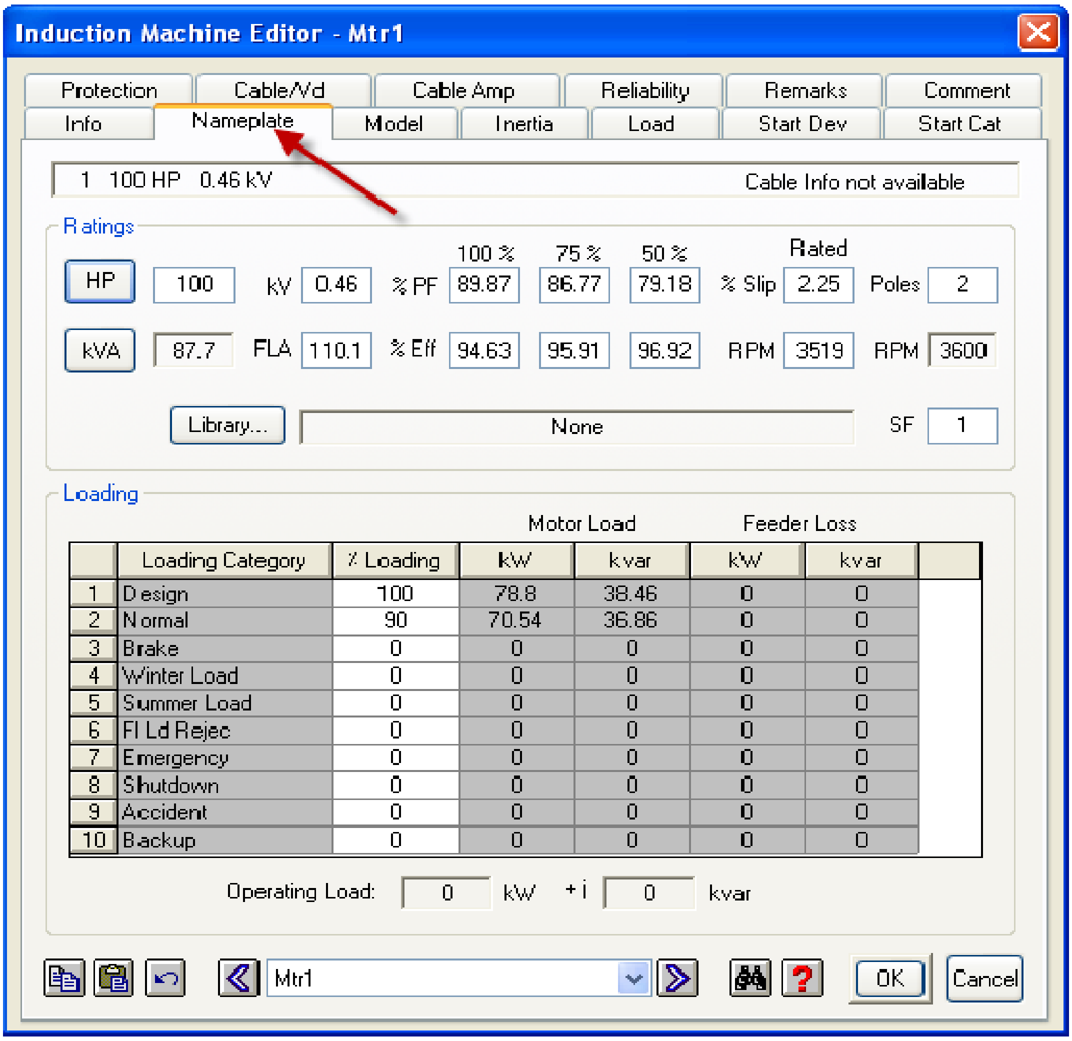
Trip Range: 300 - 1300 Amperes

CB5

Fig 8-14

افتح محرر المحرك الحثي كما مبين ادناه

Open the induction motor editor as shown below.



Induction Machine Editor - Mtr1
Protection
Cable/Vd
Cable Amp
Reliability
Remarks
Comment
Info
Nameplate
Model
Inertia
Load
Start Dev
Start Cat
Ratings
HP
kVA
Library...
Loading
Mtr1
OK
Cancel

1 100 HP 0.46 kV Cable Info not available

				100 %	75 %	50 %		Rated		
HP	100	kV	0.46	% PF	89.87	86.77	79.18	% Slip	2.25	Poles 2
kVA	87.7	FLA	110.1	% Eff	94.63	95.91	96.92	RPM	3519	RPM 3600

Library: None SF 1

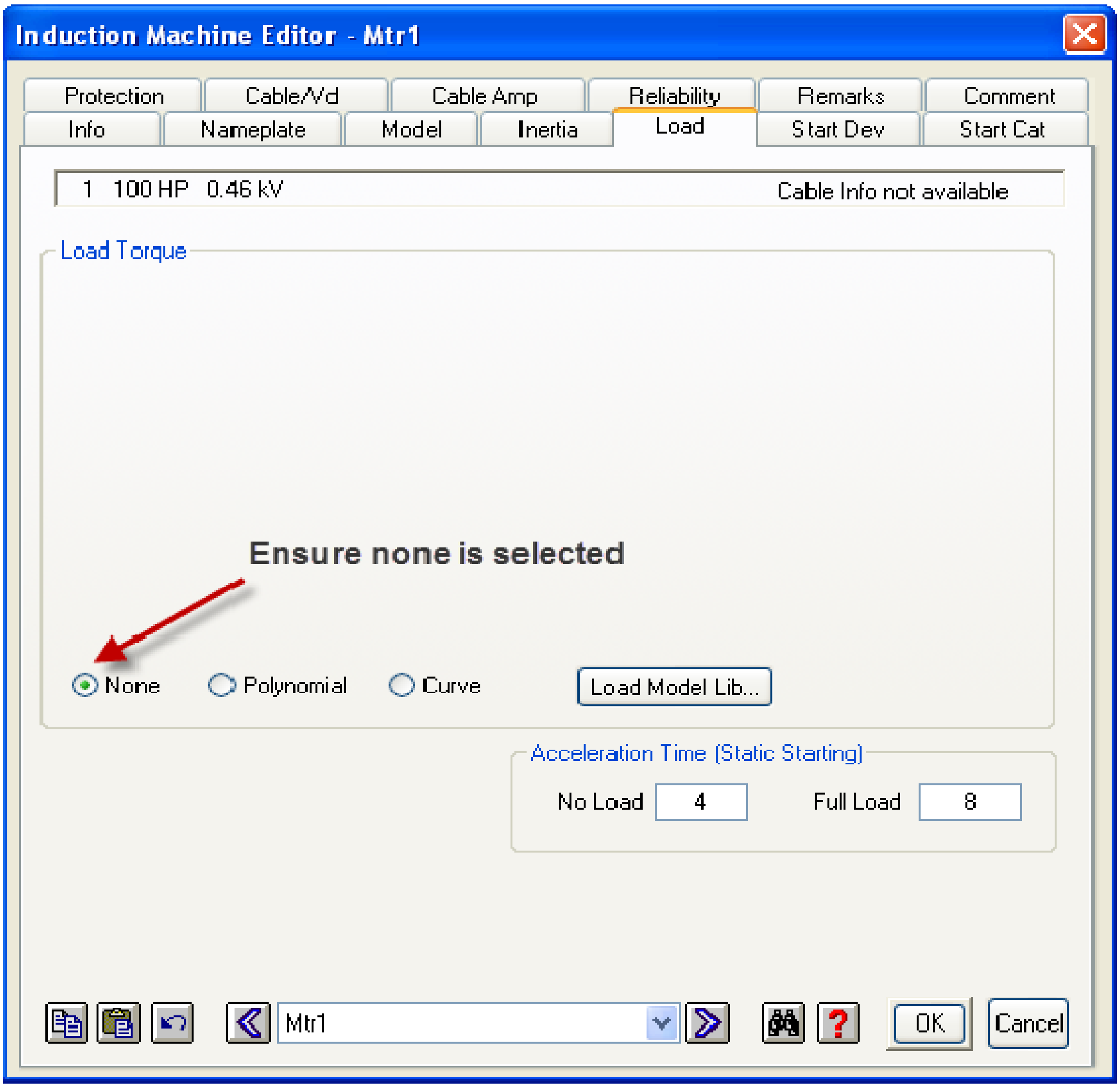
			Motor Load		Feeder Loss	
	Loading Category	% Loading	kW	kvar	kW	kvar
1	Design	100	78.8	38.46	0	0
2	Normal	90	70.54	36.86	0	0
3	Brake	0	0	0	0	0
4	Winter Load	0	0	0	0	0
5	Summer Load	0	0	0	0	0
6	Fl Ld Rejec	0	0	0	0	0
7	Emergency	0	0	0	0	0
8	Shutdown	0	0	0	0	0
9	Accident	0	0	0	0	0
10	Backup	0	0	0	0	0

Operating Load: 0 kW + j 0 kvar

Fig 8-15

انتقل الى صفحة الحمل كما مبين ادناه

Go to Load TAB as shown below.


Induction Machine Editor - Mtr1
Protection
Cable/Vd
Cable Amp
Reliability
Remarks
Comment
Info
Nameplate
Model
Inertia
Load
Start Dev
Start Cat
Load Model Lib...
Mtr1
OK
Cancel

1 100 HP 0.46 kV Cable Info not available

Load Torque

Ensure none is selected

● None ○ Polynomial ○ Curve

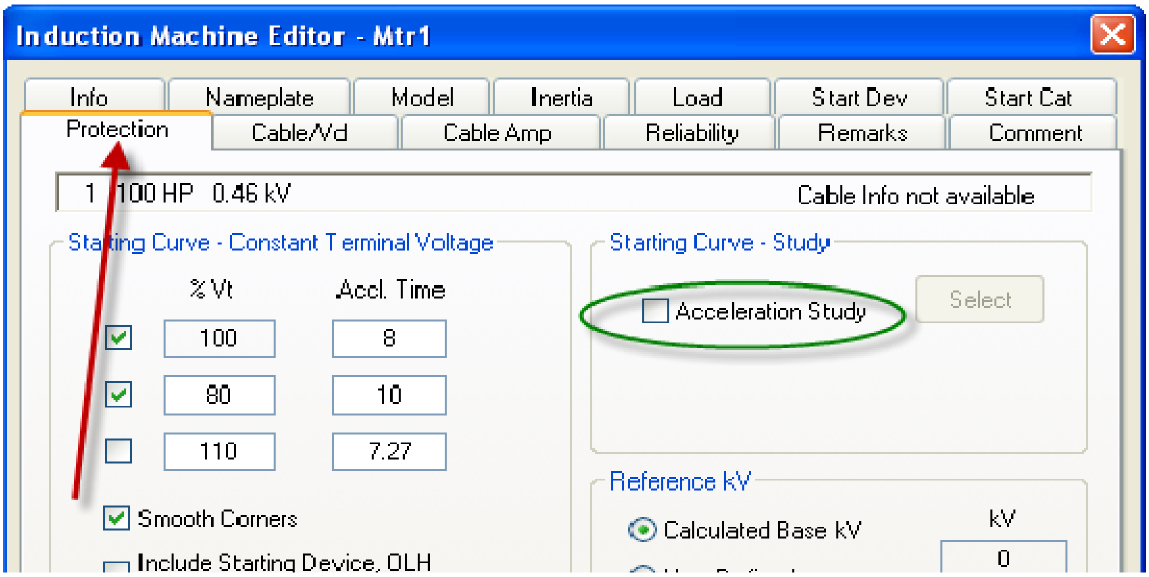
Acceleration Time (Static Starting)

No Load 4 Full Load 8

Fig 8-16

انتقل الى صفحة الحماية كما مبين ادناه

Go to protection TAB as shown below.


Induction Machine Editor - Mtr1
Info
Nameplate
Model
Inertia
Load
Start Dev
Start Cat
Protection
Cable/Vd
Cable Amp
Reliability
Remarks
Comment
Select

1 100 HP 0.46 kV Cable Info not available

Starting Curve - Constant Terminal Voltage

	%Vt	Accl. Time
☑	100	8
☑	80	10
☐	110	7.27

☑ Smooth Corners

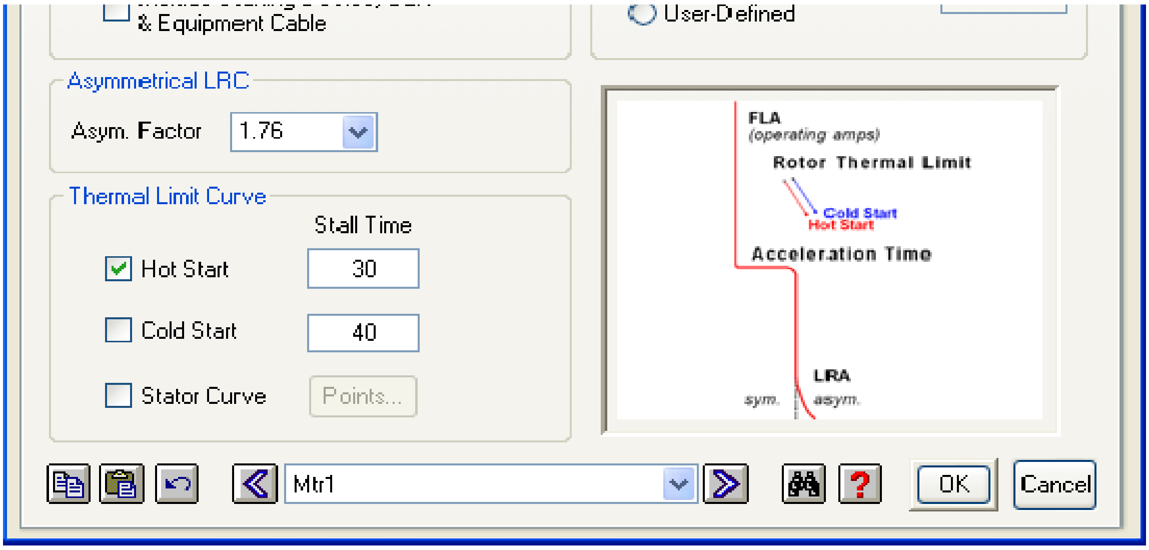
☐ Include Starting Device, OLH

Starting Curve - Study

☐ Acceleration Study

Reference kV

● Calculated Base kV kV 0



☐ & Equipment Cable

○ User-Defined

Asymmetrical LRC

Asym. Factor 1.76

Thermal Limit Curve

Stall Time

☑ Hot Start 30

☐ Cold Start 40

☐ Stator Curve Points...

FLA
(operating amps)
Rotor Thermal Limit
Cold Start
Hot Start
Acceleration Time
LRA
sym.
asym.
Mtr1
OK
Cancel

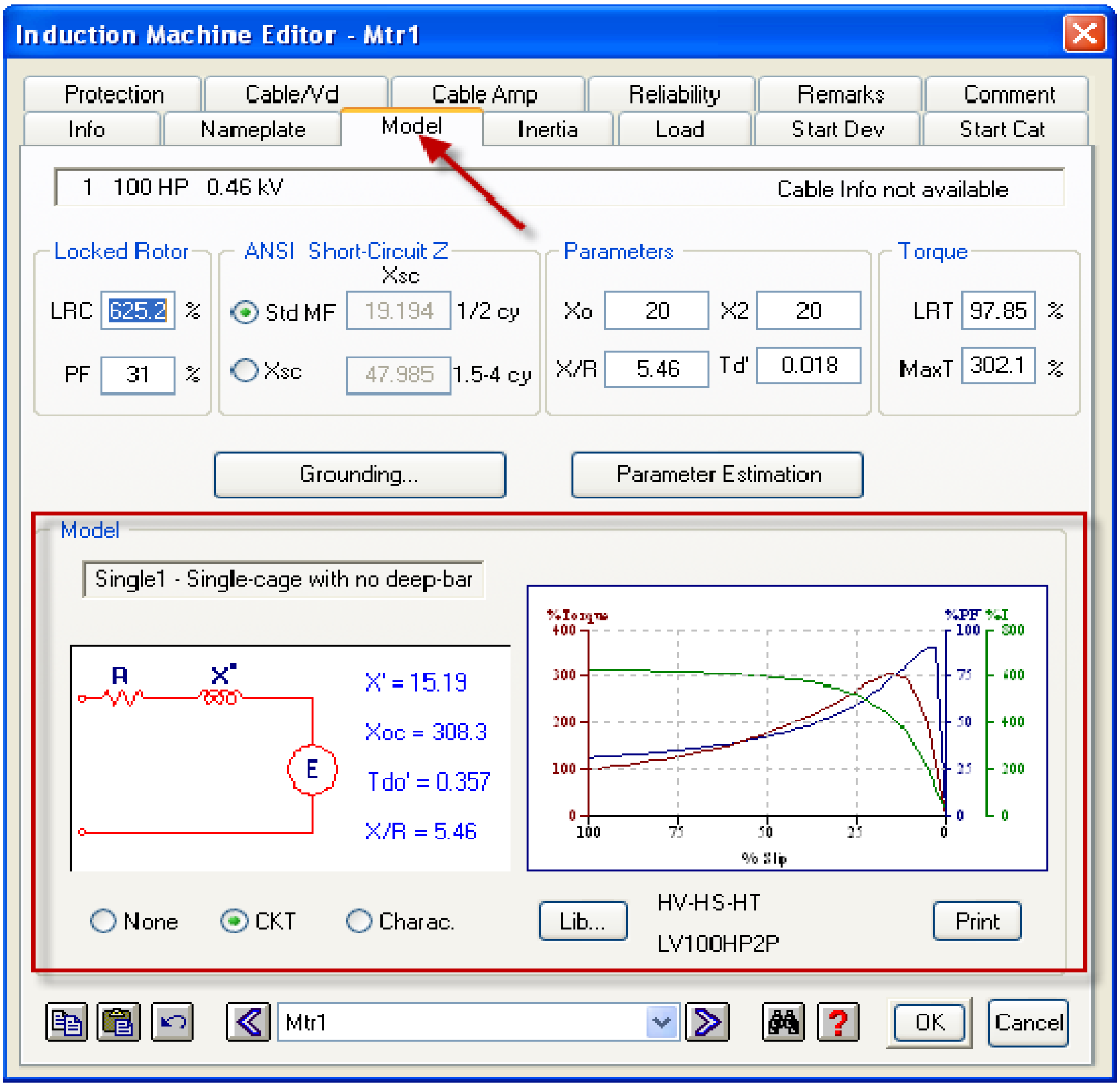
Fig 8-17

انتقل الى صفحة الموديل كما مبين ادناه

Go to model Page as shown belowl.

اضافي : باستخدام منحني تعجيل المحرك من حالة الدراسة في حسابات تيار البد للمحرك

Optional: Using motor acceleratin plot from motor starting sudy.



Induction Machine Editor - Mtr1

1 100 HP 0.46 kV Cable Info not available

Locked Rotor

LRC 625.2 %

PF 31 %

ANSI Short-Circuit Z Xsc

● Std MF 19.194 1/2 cy

○ Xsc 47.985 1.5-4 cy

Parameters

Xo 20 X2 20

X/R 5.46 Td' 0.018

Torque

LRT 97.85 %

MaxT 302.1 %

Model

Single1 - Single-cage with no deep-bar

X' = 15.19

Xoc = 308.3

Tdo' = 0.357

X/R = 5.46

○ None ● CKT ○ Charac.

HV-HS-HT

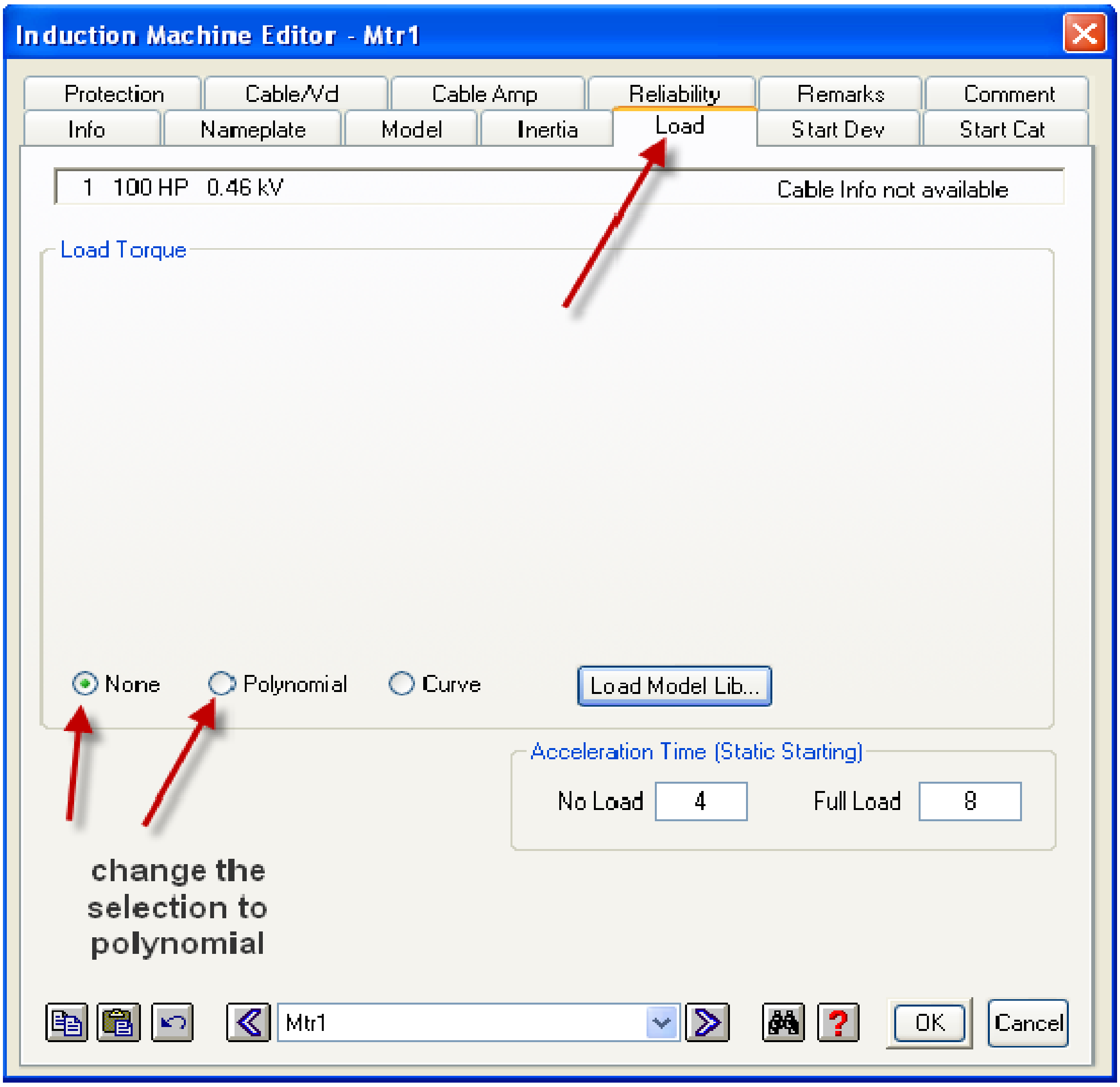
LV100HP2P

Protection
Cable/Vd
Cable Amp
Reliability
Remarks
Comment
Info
Nameplate
Model
Inertia
Load
Start Dev
Start Cat
Grounding...
Parameter Estimation
R
X'
E
%Torque
400
300
200
100
0
100
75
50
25
0
% Slip
%PF %I
100
75
50
25
0
800
600
400
200
0
Lib...
Print
Mtr1
OK
Cancel

Fig 8-18

انتقل الى صفحة الحمل كما مبين ادناه

Go to load TAB as shown below


Induction Machine Editor - Mtr1
Protection
Cable/Vd
Cable Amp
Reliability
Remarks
Comment
Info
Nameplate
Model
Inertia
Load
Start Dev
Start Cat
Load Torque
Load Model Lib...
Acceleration Time (Static Starting)
OK
Cancel

1 100 HP 0.46 kV
Cable Info not available

● None ○ Polynomial ○ Curve

No Load: 4
Full Load: 8

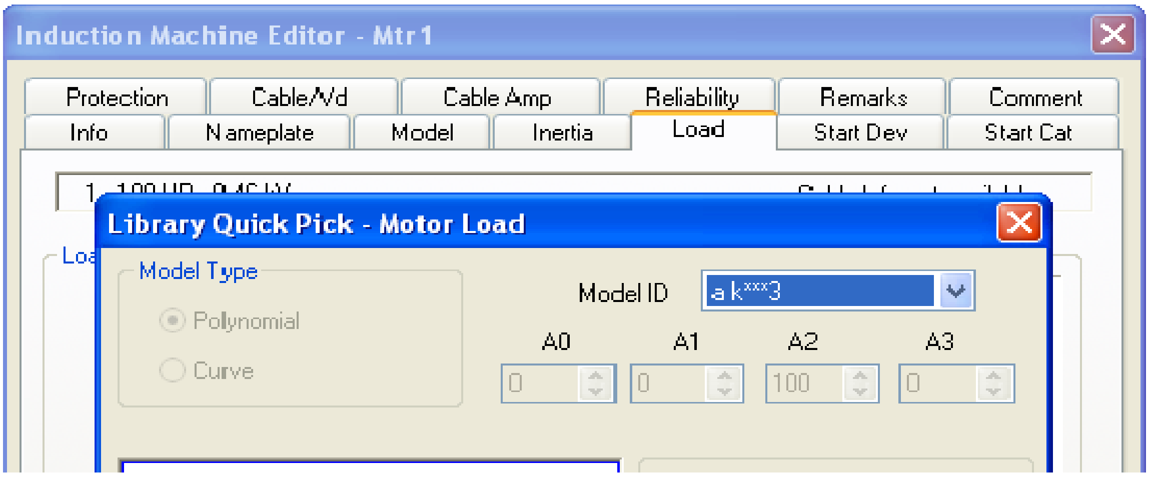
Mtr1

change the selection to polynomial

Fig 8-19

Change the selection to polynomial as shown in the figure above. And note the window that will appear in the figure below.

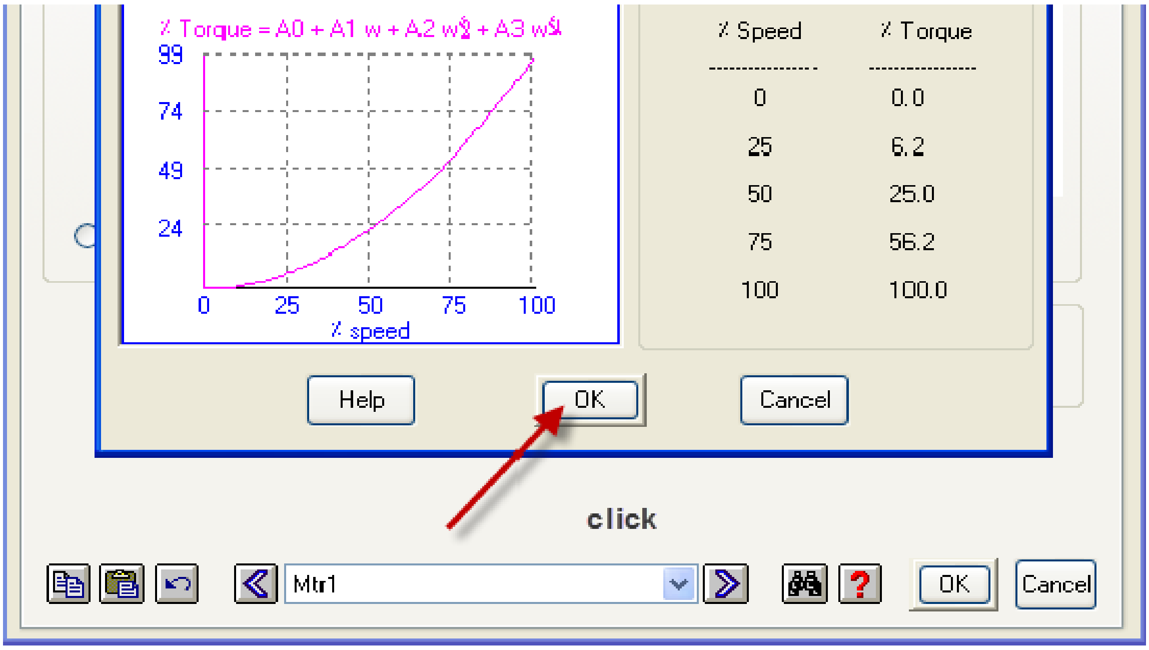
غير الاختيار الى Polynomial كما مبين اعلاه ولاحظ النافذة التي ستظهر في الشكل الاسفل


Induction Machine Editor - Mtr1
Protection
Cable/Vd
Cable Amp
Reliability
Remarks
Comment
Info
Nameplate
Model
Inertia
Load
Start Dev
Start Cat
Library Quick Pick - Motor Load
Model Type

● Polynomial
○ Curve

Model ID: a k***3

A0	A1	A2	A3
0	0	100	0

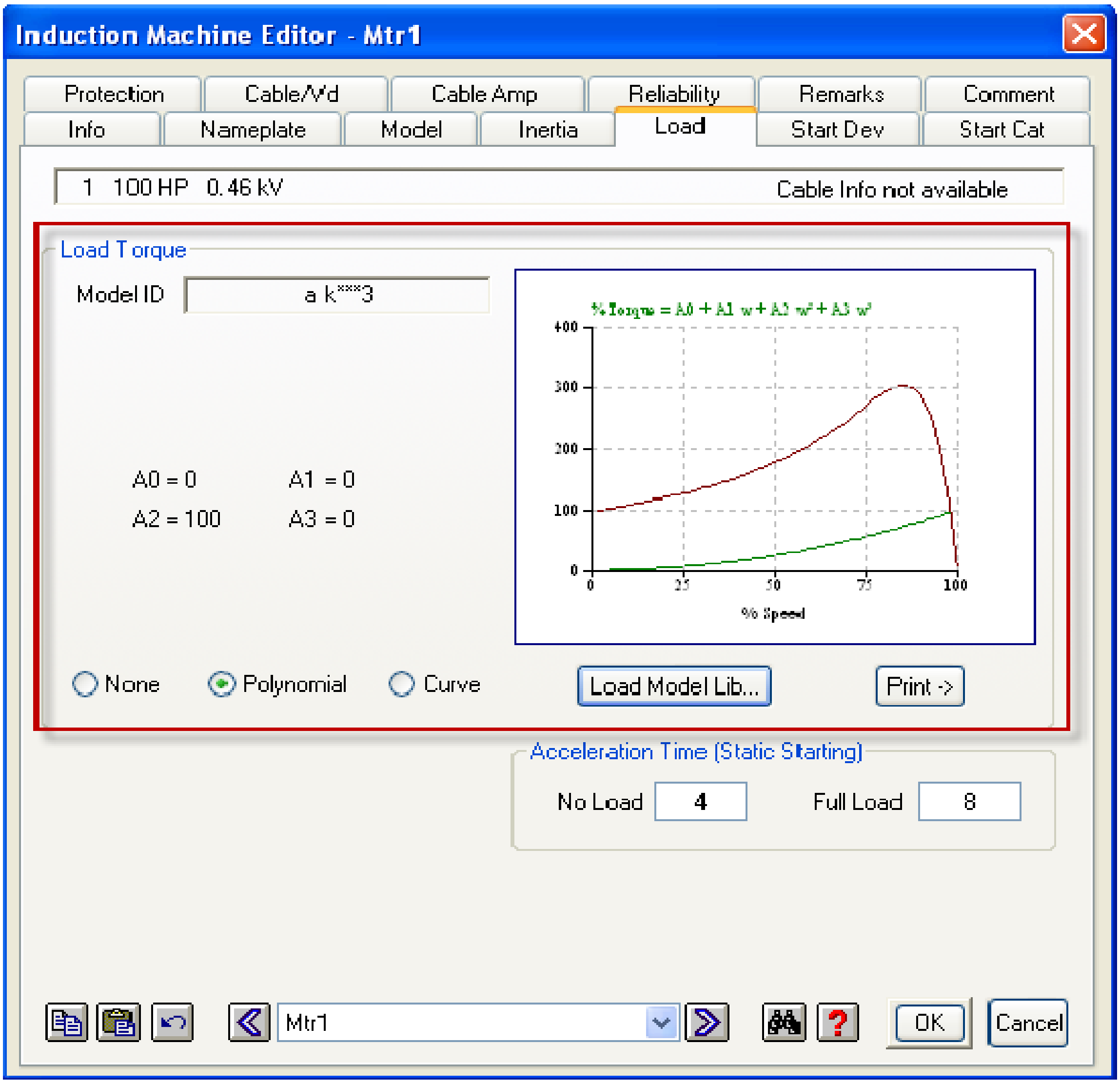

% Torque = A0 + A1 w + A2 w² + A3 w³
99
74
49
24
0
25
50
75
100
% speed
Help
OK
Cancel
click
Mtr1
OK
Cancel

% Speed	% Torque
0	0.0
25	6.2
50	25.0
75	56.2
100	100.0

Fig 8-20

وسيظهر لنا الشكل المبين ادناه

and the below figure will appear


Induction Machine Editor - Mtr1
Protection
Cable/Vd
Cable Amp
Reliability
Remarks
Comment
Info
Nameplate
Model
Inertia
Load
Start Dev
Start Cat
Load Torque
% Torque = A0 + A1 w + A2 w² + A3 w³
400
300
200
100
0
25
50
75
100
% Speed
Load Model Lib...
Print ->
Acceleration Time (Static Starting)
Mtr1
OK
Cancel

1 100 HP 0.46 kV Cable Info not available

Model ID a k***3

A0 = 0 A1 = 0

A2 = 100 A3 = 0

○ None ● Polynomial ○ Curve

No Load 4 Full Load 8

Fig 8-21

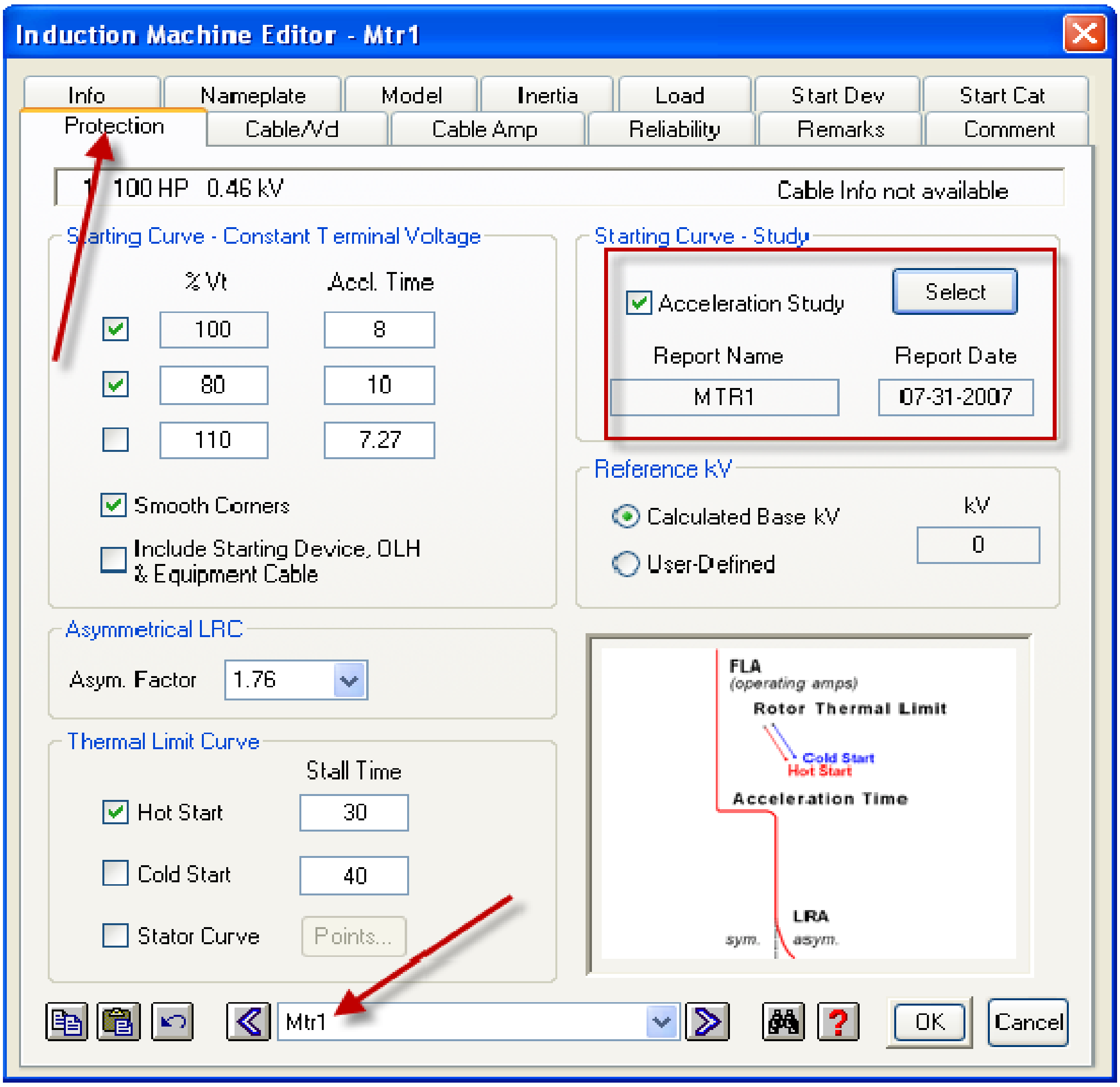
قم بتشغيل حسابات تسارع المحرك باستخدام حالة الدراسة الموجودة والتي من خلالها يبدا المحرك بالدوران بعد 0.1 ثانية
قم بتسمية التقرير ب MTR1
قم باختيار منحنى التشغيل لحالة الدراسة MTR1

- Run Motor Acceleration with Mtr1 starting at 0.1 seconds. Name the output report as MTR1

- Select Motor Acceleration Study (MTR1) curve

لاختيار حالة الدراسة انظر الشكل ادناه

To select the case study , see the figure below.


Info
Nameplate
Model
Inertia
Load
Start Dev
Start Cat
Protection
Cable/Vd
Cable Amp
Reliability
Remarks
Comment
Select
FLA
(operating amps)
Rotor Thermal Limit
Cold Start
Hot Start
Acceleration Time
LRA
sym.
asym.
OK
Cancel

Induction Machine Editor - Mtr1

1 100 HP 0.46 kV Cable Info not available

Starting Curve - Constant Terminal Voltage

	%Vt	Accl. Time
☑	100	8
☑	80	10
☐	110	7.27

☑ Smooth Corners
☐ Include Starting Device, OLH & Equipment Cable

Starting Curve - Study

☑ Acceleration Study
Report Name: MTR1
Report Date: 07-31-2007

Reference kV

● Calculated Base kV
○ User-Defined
kV: 0

Asymmetrical LRC

Asym. Factor: 1.76

Thermal Limit Curve

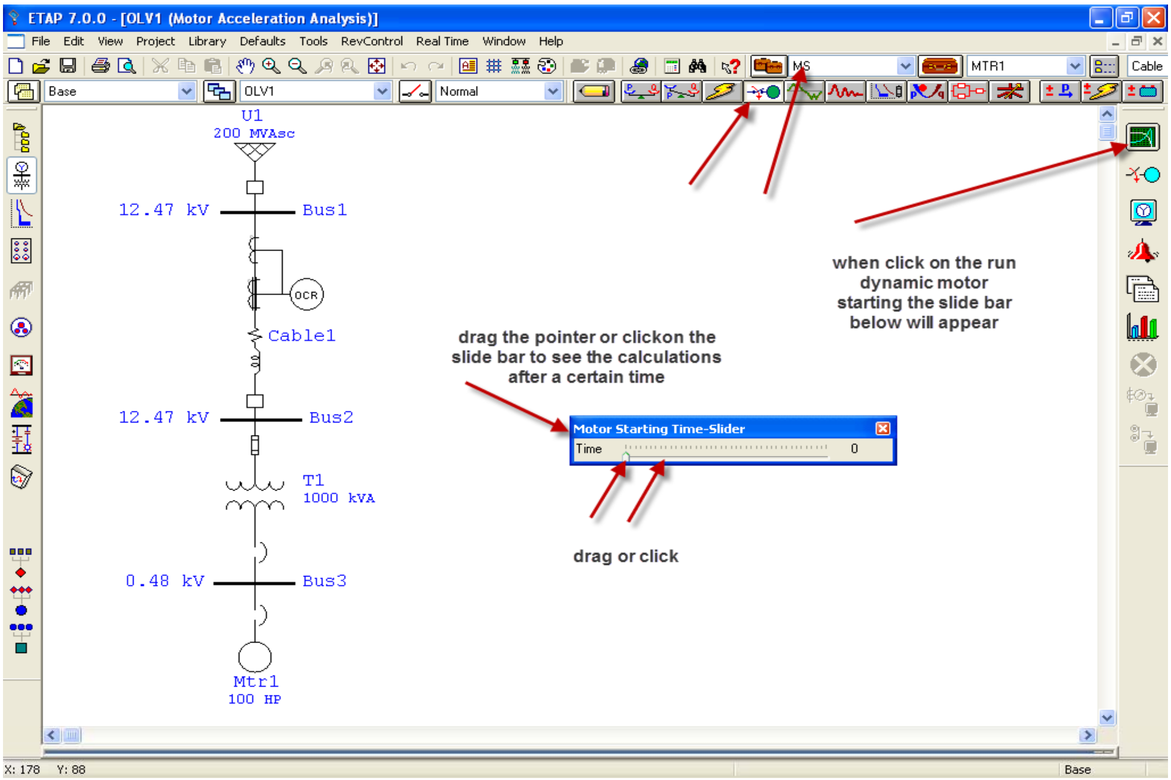
	Stall Time
☑ Hot Start	30
☐ Cold Start	40
☐ Stator Curve	Points...

Mtr1

Fig 8-22

في مخطط المشروع وبعد اكمال تضبيط القيم انقر على تشغيل حسابات بدء المحرك للحصول على النتائج
سيظهر المؤشر المنزلق الذي من خلاله يمكن اظهار قيم الحسابات في أي فترة زمنية

In the one line diagram,and after checkin the settings , click on run dynamic motor starting to see the results
a sliding bar will appear, which you can drag the pointer to any time and check the results within that time

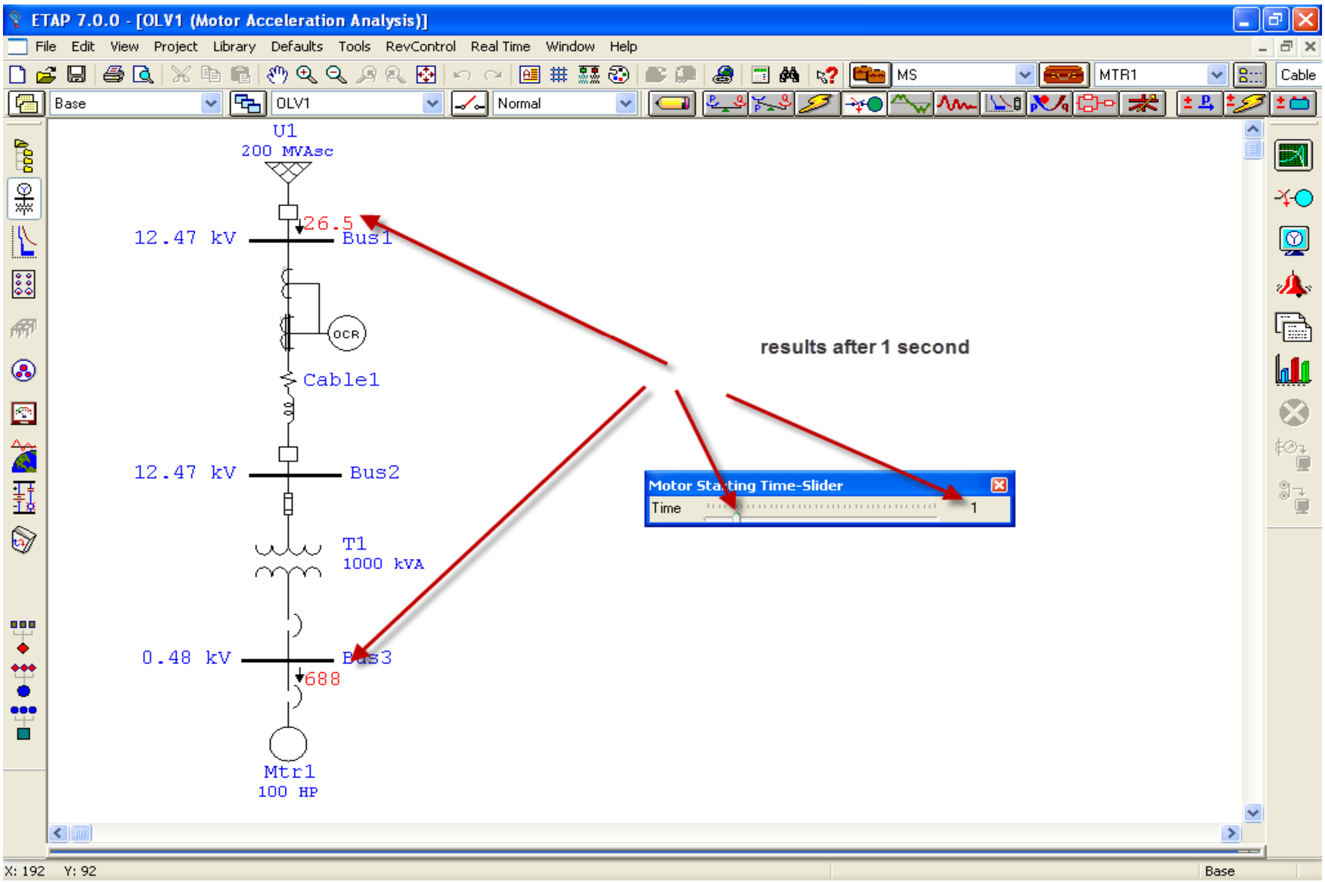

ETAP 7.0.0 - [OLV1 (Motor Acceleration Analysis)]
File Edit View Project Library Defaults Tools RevControl Real Time Window Help
MS
MTR1
Cable
Base
OLV1
Normal
U1
200 MVAsc
12.47 kV
Bus1
OCR
Cable1
12.47 kV
Bus2
T1
1000 kVA
0.48 kV
Bus3
Mtr1
100 HP
Motor Starting Time-Slider
Time
0
X: 178 Y: 88
Base

when click on the run dynamic motor starting the slide bar below will appear

drag the pointer or clickon the slide bar to see the calculations after a certain time

drag or click

Fig 8-23

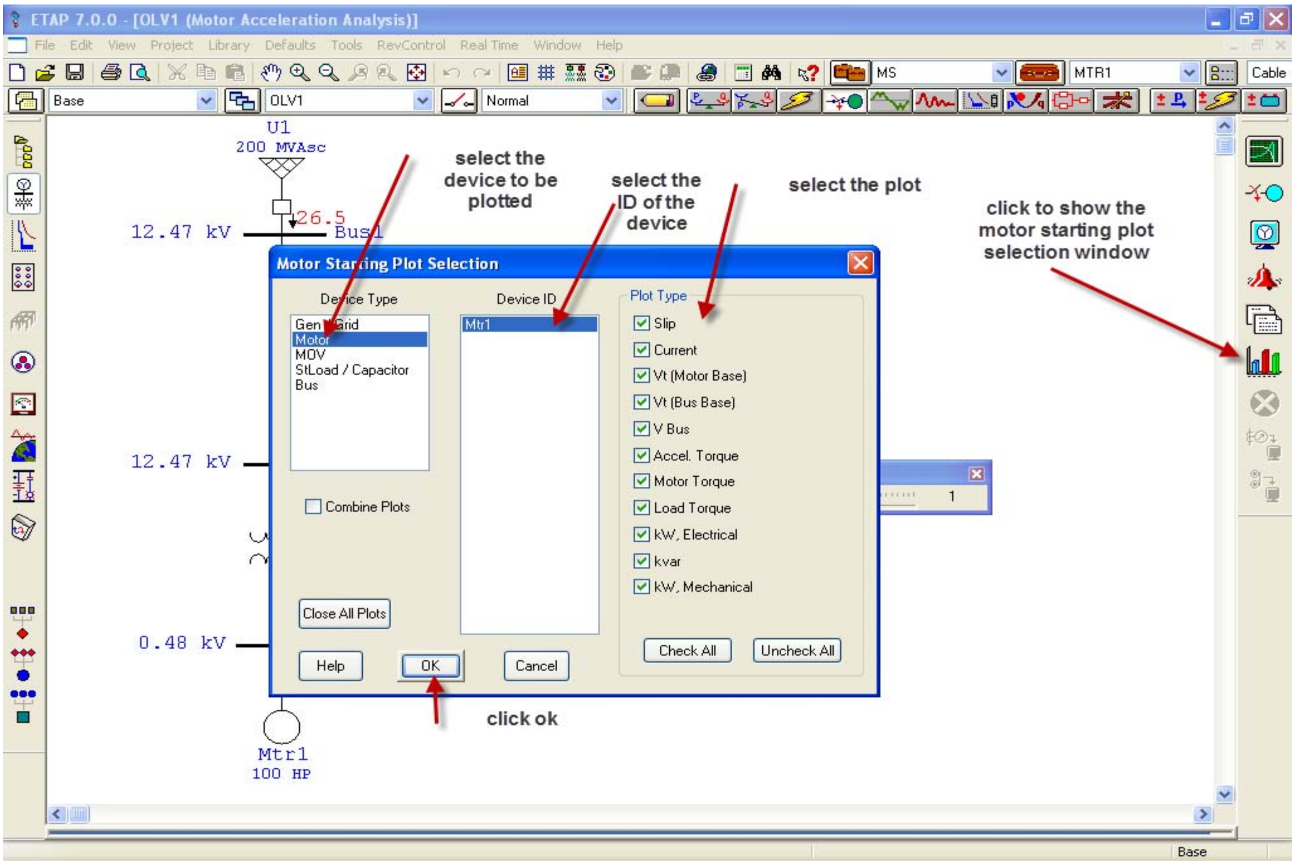

ETAP 7.0.0 - [OLV1 (Motor Acceleration Analysis)]
File Edit View Project Library Defaults Tools RevControl Real Time Window Help
MS
MTR1
Cable
Base
OLV1
Normal
U1
200 MVAsc
26.5
12.47 kV
Bus1
OCR
Cable1
12.47 kV
Bus2
T1
1000 kVA
0.48 kV
Bus3
688
Mtr1
100 HP
Motor Starting Time-Slider
Time
1
X: 192 Y: 92
Base

results after 1 second

Fig 8-24

باستخدام ايقونة مخططات بدء المحرك يمكن الحصول على عدة مخططات للداءرة وكما مبين ادناه

by using the motor starting plots icon , we may have several plots related to motor starting , see belowl.


ETAP 7.0.0 - [OLV1 (Motor Acceleration Analysis)]
File Edit View Project Library Defaults Tools RevControl Real Time Window Help
MS
MTR1
Cable
Base
OLV1
Normal
U1
200 MVAsc
12.47 kV
26.5
Bus1
12.47 kV
0.48 kV
Mtr1
100 HP
1
Base

select the device to be plotted

select the ID of the device

select the plot

click to show the motor starting plot selection window

Motor Starting Plot Selection

Device Type: Gen / Grid, **Motor**, MOV, StLoad / Capacitor, Bus

Device ID: **Mtr1**

☐ Combine Plots

Plot Type:
- ☑ Slip
- ☑ Current
- ☑ Vt (Motor Base)
- ☑ Vt (Bus Base)
- ☑ V Bus
- ☑ Accel. Torque
- ☑ Motor Torque
- ☑ Load Torque
- ☑ kW, Electrical
- ☑ kvar
- ☑ kW, Mechanical

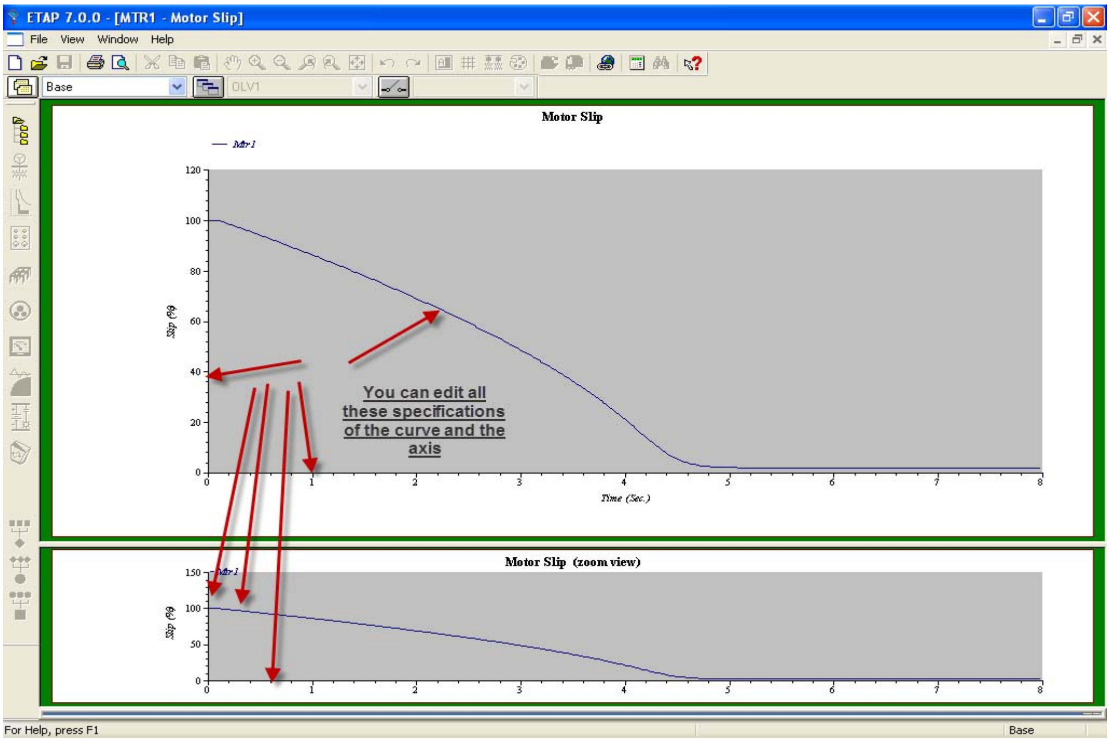
Close All Plots
Help
OK
Cancel
Check All
Uncheck All

click ok

Fig 8-25

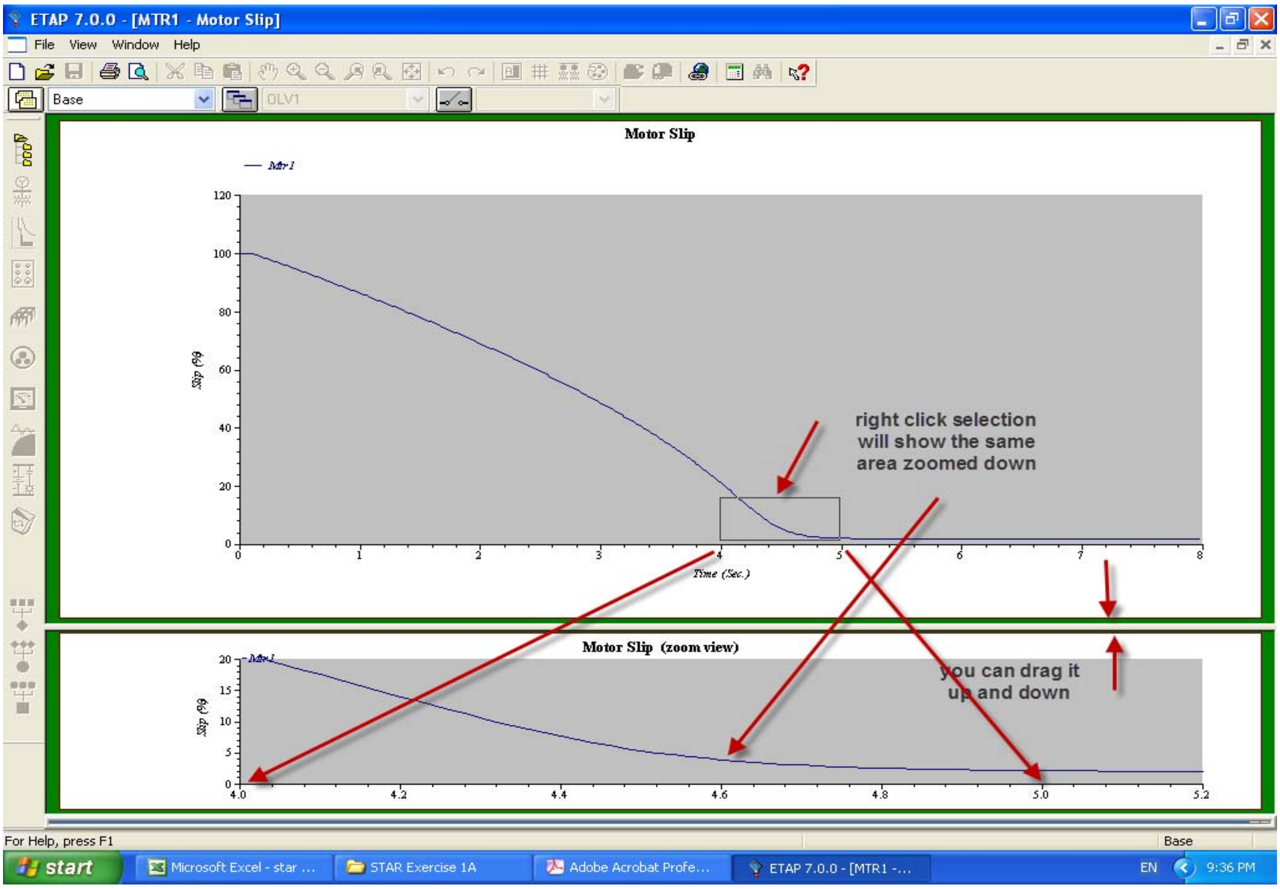
سوف نظهر منحني الانزلاق فقط كمثال

We will show slip curve only as an example


ETAP 7.0.0 - [MTR1 - Motor Slip]
File View Window Help
Base
OLV1
Motor Slip
Mtr1
120
100
80
60
40
20
0
Slip (%)
0
1
2
3
4
5
6
7
8
Time (Sec.)
Motor Slip (zoom view)
Mtr1
150
100
50
0
Slip (%)
0
1
2
3
4
5
6
7
8
For Help, press F1
Base

You can edit all these specifications of the curve and the axis

Fig 8-26


ETAP 7.0.0 - [MTR1 - Motor Slip]
File View Window Help
Base
OLV1
Motor Slip
Mtr1
120
100
80
60
40
20
0
Slip (%)
0 1 2 3 4 5 6 7 8
Time (Sec.)
Motor Slip (zoom view)
Mtr1
20
15
10
5
0
Slip (%)
4.0 4.2 4.4 4.6 4.8 5.0 5.2
For Help, press F1
Base
start
Microsoft Excel - star ...
STAR Exercise 1A
Adobe Acrobat Profe...
ETAP 7.0.0 - [MTR1 -...
EN
9:36 PM

right click selection will show the same area zoomed down

you can drag it up and down

Fig 8-27

STAR Exercise 2A

الغرض من التمرين

- اضافة تضبيط معدات الحماية المربوطة على الطور والارضي
- فحص تناسق التشغيل بين معدات الحماية المربوطة على الطور والارضي باستخدام منحنيات التيار- الزمن (TCC(time current curves)

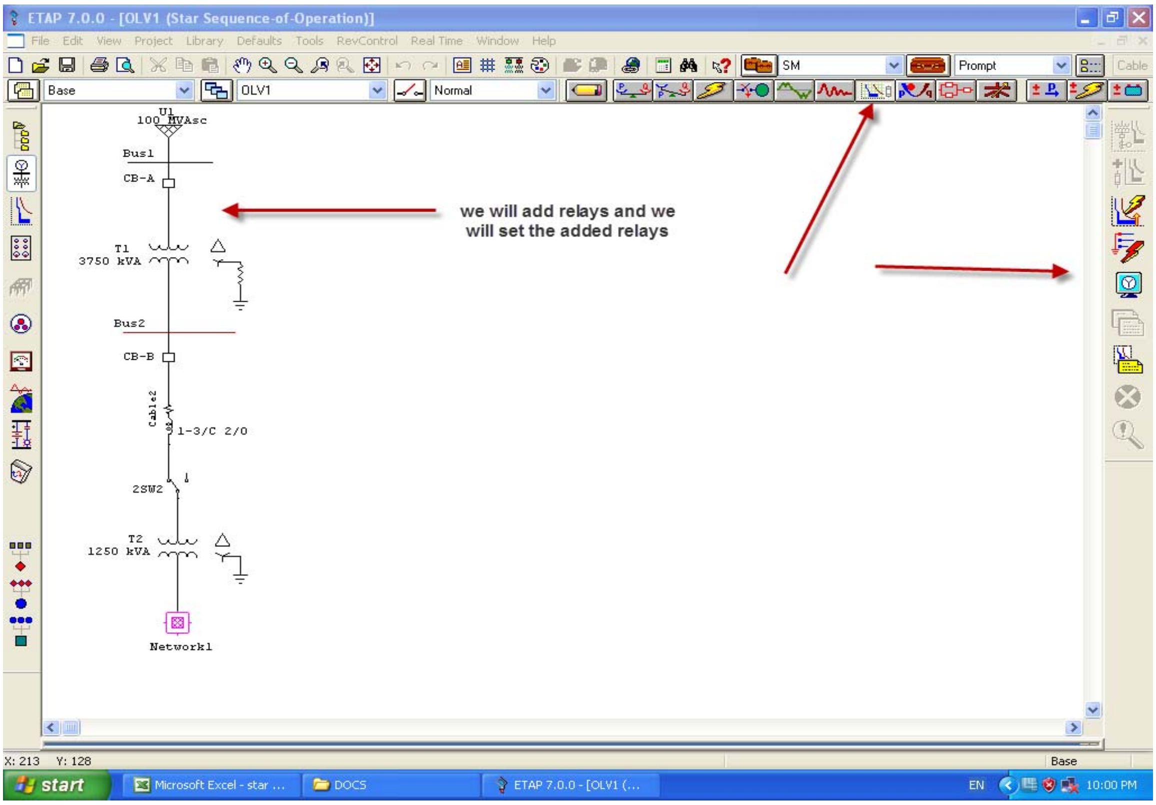
وباستخدام تسلسل الاشتغال (SQOP)Sequence of operation

Purpose

- Add protective device settings for phase and ground
- Test coordination and protection settings for phase and ground using TCC and SQOP.

يرجى فتح الملف **Device Coordination\STAR Exercise 2A كما مبين ادناه**
وكذلك ملف التمرين **Device coordination/docs/star exercise 2A**

Please open the example 08/Device coordination/star exercise 2A as shown below
and the exercise file Device coordination /docs/star exercise 2A

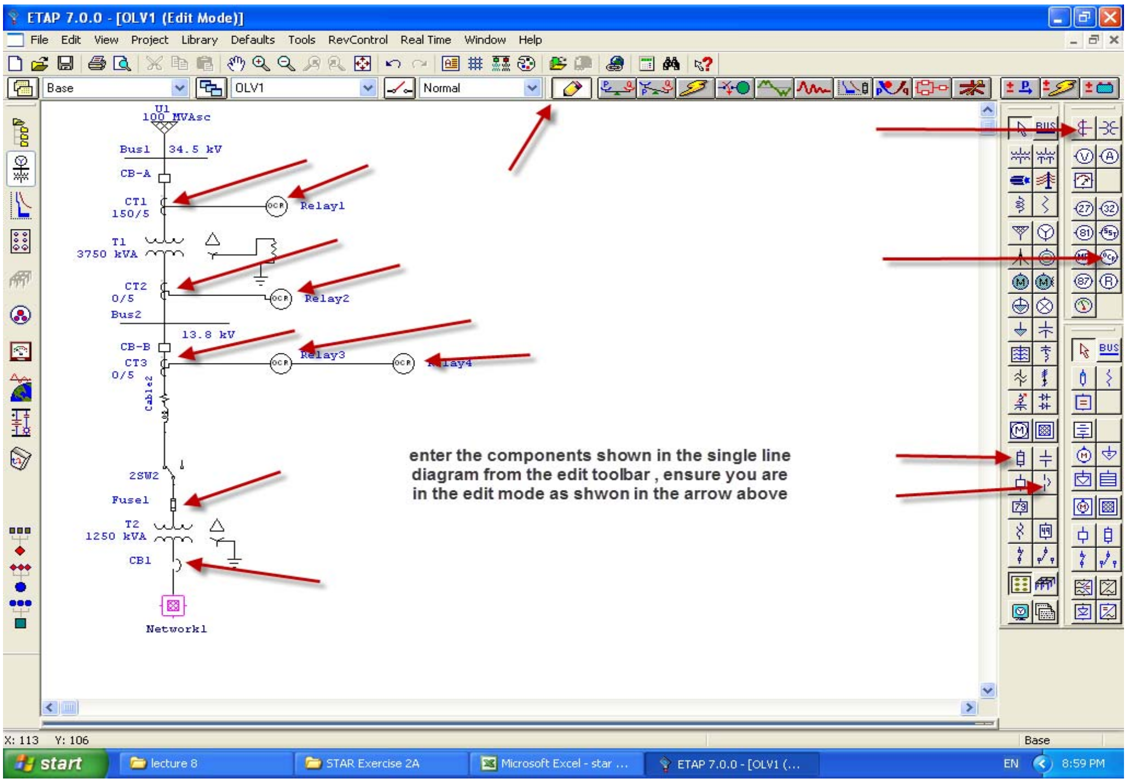

ETAP 7.0.0 - [OLV1 (Star Sequence-of-Operation)]
File Edit View Project Library Defaults Tools RevControl Real Time Window Help
SM
Prompt
Cable
Base
OLV1
Normal
U1
100 MVAsc
Bus1
CB-A
T1
3750 kVA
Bus2
CB-B
Cable2
1-3/C 2/0
2SW2
T2
1250 kVA
Network1
X: 213 Y: 128
Base
start
Microsoft Excel - star ...
DOCS
ETAP 7.0.0 - [OLV1 (...
EN
10:00 PM

we will add relays and we will set the added relays

Fig 8-28

قم باضافة مرحل حماية زيادة التحميل ومحول التيار الخاص به وكما مبين ادناه (لاتنسى ان تتحول الى ايقونة التحرير في شريط الحالة)
وقم بالتوصيلات اللازمة
افتح محرر المرحل ومحرر محول التيار لادخال المعطيات

Add over current rely with its current transformer as shown below.(don't forget to switch to Edit Mode).
in the mode toolbar, and complete the required connections
open the overcurrent relay editor and the current transformer editor for settings.

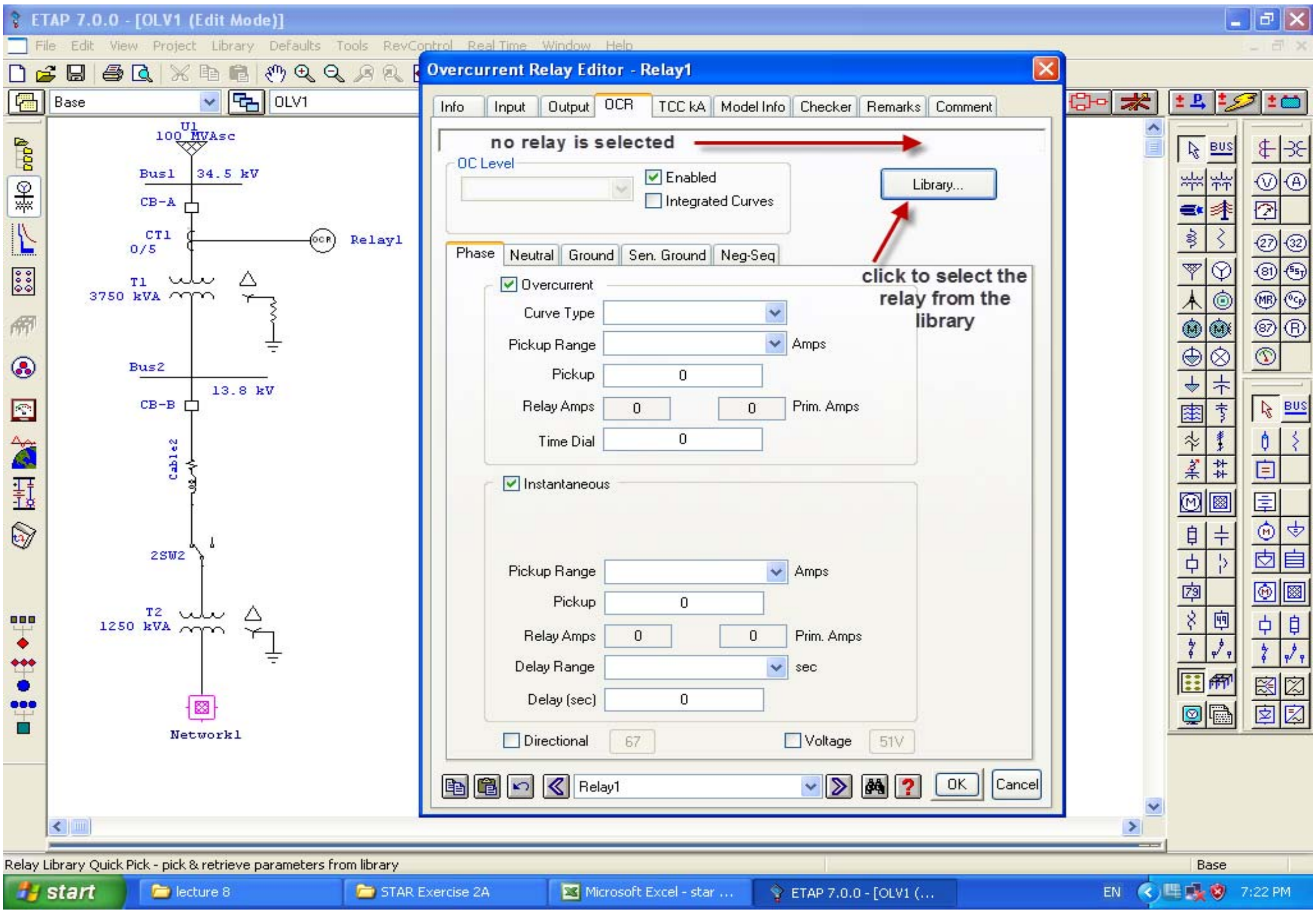

ETAP 7.0.0 - [OLV1 (Edit Mode)]
File Edit View Project Library Defaults Tools RevControl Real Time Window Help
Base
OLV1
Normal
U1
100 MVAsc
Bus1
34.5 kV
CB-A
CT1
150/5
Relay1
T1
3750 kVA
CT2
0/5
Relay2
Bus2
13.8 kV
CB-B
CT3
0/5
Relay3
Relay4
Cable2
2SW2
Fuse1
T2
1250 kVA
CB1
Network1
BUS
X: 113 Y: 106
Base
start
lecture 8
STAR Exercise 2A
Microsoft Excel - star ...
ETAP 7.0.0 - [OLV1 (...
EN
8:59 PM

enter the components shown in the single line diagram from the edit toolbar , ensure you are in the edit mode as shwon in the arrow above

Fig 8-29

انقر على المكتبة لاختيار المرحل المطلوب ثم اختر المرحل والمواصفات المطلوبة كما مبين ادناه ثم انقر موافق
ادخال المعطيات يكون في صفحة OCR من المحرر

Click on Library to select the relay and then select its specifications as shown below. Then click OK information to be inserted in OCR TAB of the editor


ETAP 7.0.0 - [OLV1 (Edit Mode)]
File Edit View Project Library Defaults Tools RevControl Real Time Window Help
Base
OLV1
U1
100 MVAsc
Bus1
34.5 kV
CB-A
CT1
0/5
OCR
Relay1
T1
3750 kVA
Bus2
13.8 kV
CB-B
Cable2
2SW2
T2
1250 kVA
Network1
Info
Input
Output
OCR
TCC kA
Model Info
Checker
Remarks
Comment
Library...
OK
Cancel
Base
start
lecture 8
STAR Exercise 2A
Microsoft Excel - star ...
ETAP 7.0.0 - [OLV1 (...
EN
7:22 PM

Overcurrent Relay Editor - Relay1

no relay is selected

OC Level: ☑ Enabled ☐ Integrated Curves

click to select the relay from the library

Phase | Neutral | Ground | Sen. Ground | Neg-Seq

☑ Overcurrent
Curve Type:
Pickup Range: Amps
Pickup: 0
Relay Amps: 0 0 Prim. Amps
Time Dial: 0

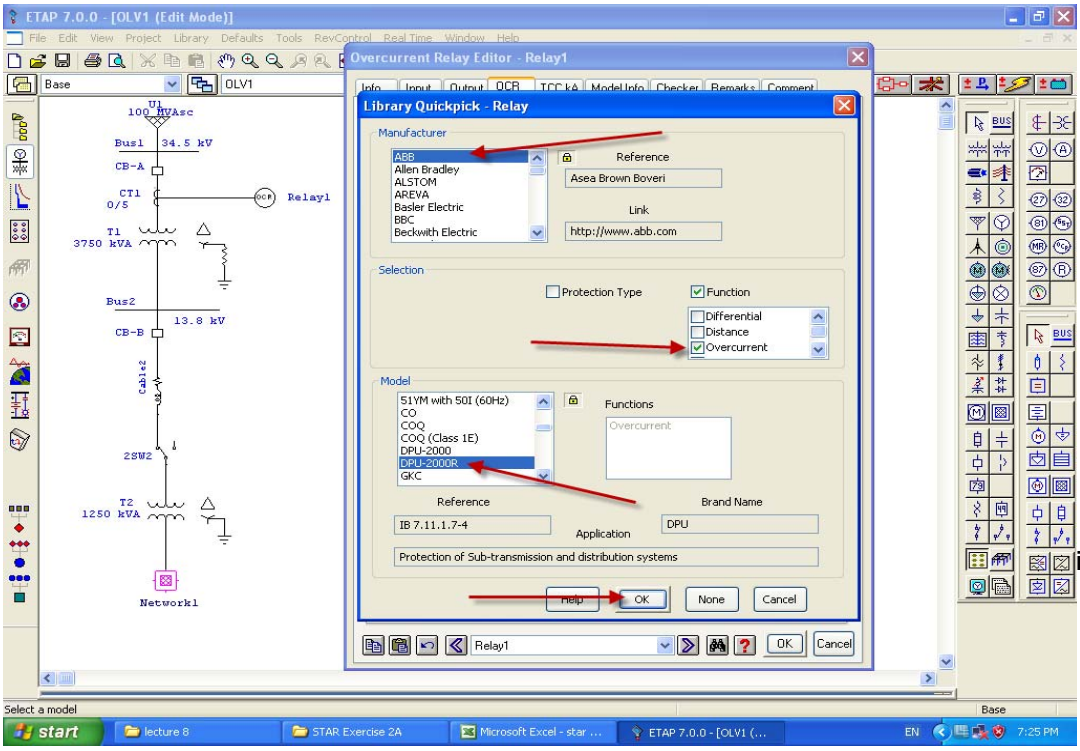
☑ Instantaneous
Pickup Range: Amps
Pickup: 0
Relay Amps: 0 0 Prim. Amps
Delay Range: sec
Delay (sec): 0

☐ Directional 67 ☐ Voltage 51V

Relay1

Relay Library Quick Pick - pick & retrieve parameters from library

Fig 8-30


ETAP 7.0.0 - [OLV1 (Edit Mode)]
File Edit View Project Library Defaults Tools RevControl Real Time Window Help
Base
OLV1
U1
100 MVAsc
Bus1
34.5 kV
CB-A
CT1
0/5
OCR
Relay1
T1
3750 kVA
Bus2
13.8 kV
CB-B
Cable2
2SW2
T2
1250 kVA
Network1
Overcurrent Relay Editor - Relay1
Info
Input
Output
OCR
TCC kA
Model Info
Checker
Remarks
Comment
Help
OK
None
Cancel
OK
Cancel
Base
start
lecture 8
STAR Exercise 2A
Microsoft Excel - star ...
ETAP 7.0.0 - [OLV1 (...
EN
7:25 PM

Library Quickpick - Relay

Manufacturer: ABB, Allen Bradley, ALSTOM, AREVA, Basler Electric, BBC, Beckwith Electric

Reference: Asea Brown Boveri

Link: http://www.abb.com

Selection: ☐ Protection Type ☑ Function

☐ Differential
☐ Distance
☑ Overcurrent

Model: 51YM with 50I (60Hz), CO, COQ, COQ (Class 1E), DPU-2000, DPU-2000R, GKC

Functions: Overcurrent

Reference: IB 7.11.1.7-4

Brand Name: DPU

Application: Protection of Sub-transmission and distribution systems

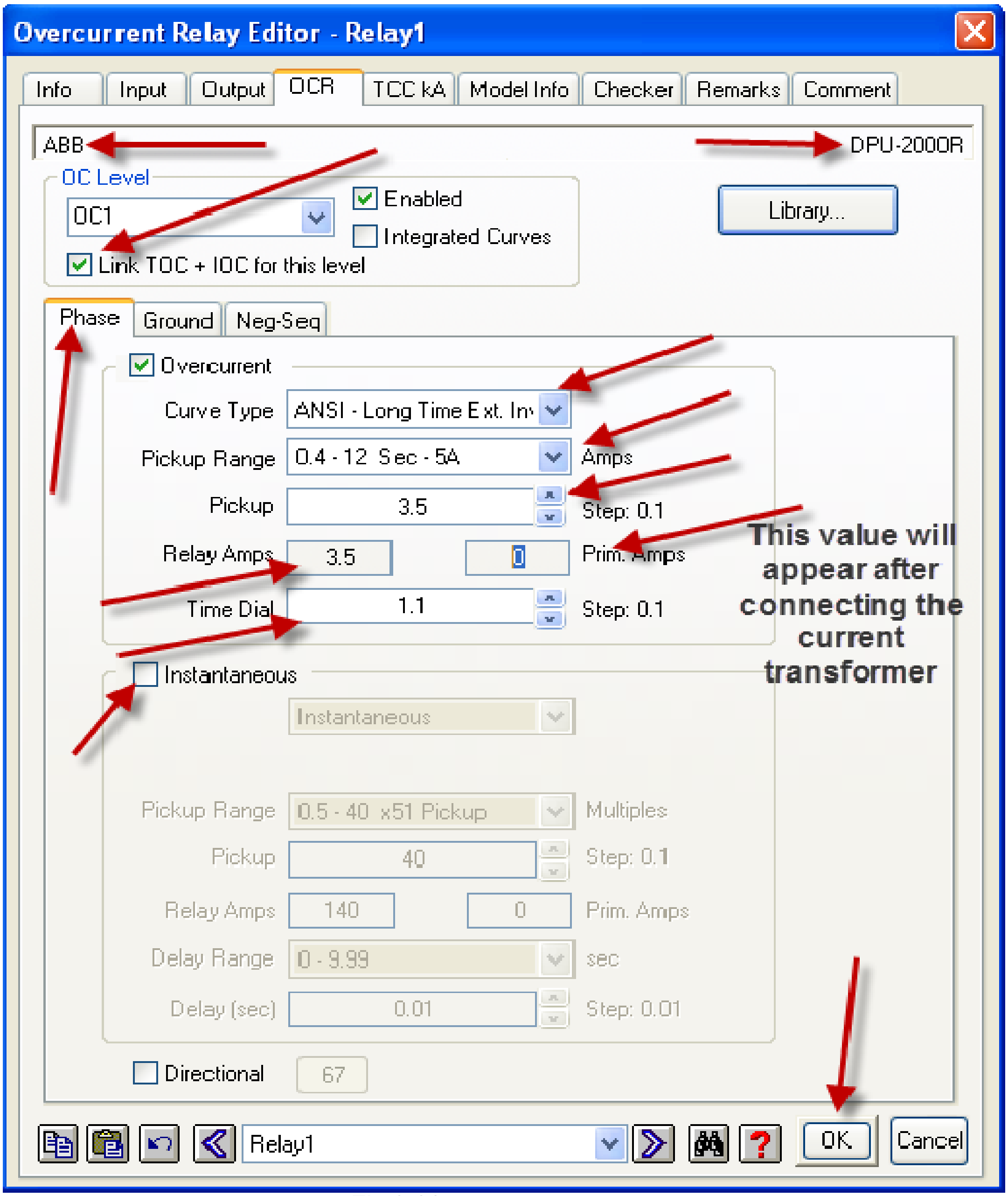
Relay1

Select a model

ig 8-31

بعد النقر على موافق سوف تتغير هيئة الصفحة في المحرر
ادخل القيم المبينة ادناه ثم انقر موافق

after click on Ok the editor TAB will change as shown below.
enter the valuse shown below then click OK



Overcurrent Relay Editor - Relay1

ABB
DPU-2000R

OC Level: OC1
☑ Enabled
☐ Integrated Curves
☑ Link TOC + IOC for this level

Phase

☑ Overcurrent
Curve Type: ANSI - Long Time Ext. Inv
Pickup Range: 0.4 - 12 Sec - 5A Amps
Pickup: 3.5 Step: 0.1
Relay Amps: 3.5 0 Prim. Amps
Time Dial: 1.1 Step: 0.1

☐ Instantaneous
Instantaneous
Pickup Range: 0.5 - 40 x51 Pickup Multiples
Pickup: 40 Step: 0.1
Relay Amps: 140 0 Prim. Amps
Delay Range: 0 - 9.99 sec
Delay (sec): 0.01 Step: 0.01

☐ Directional 67

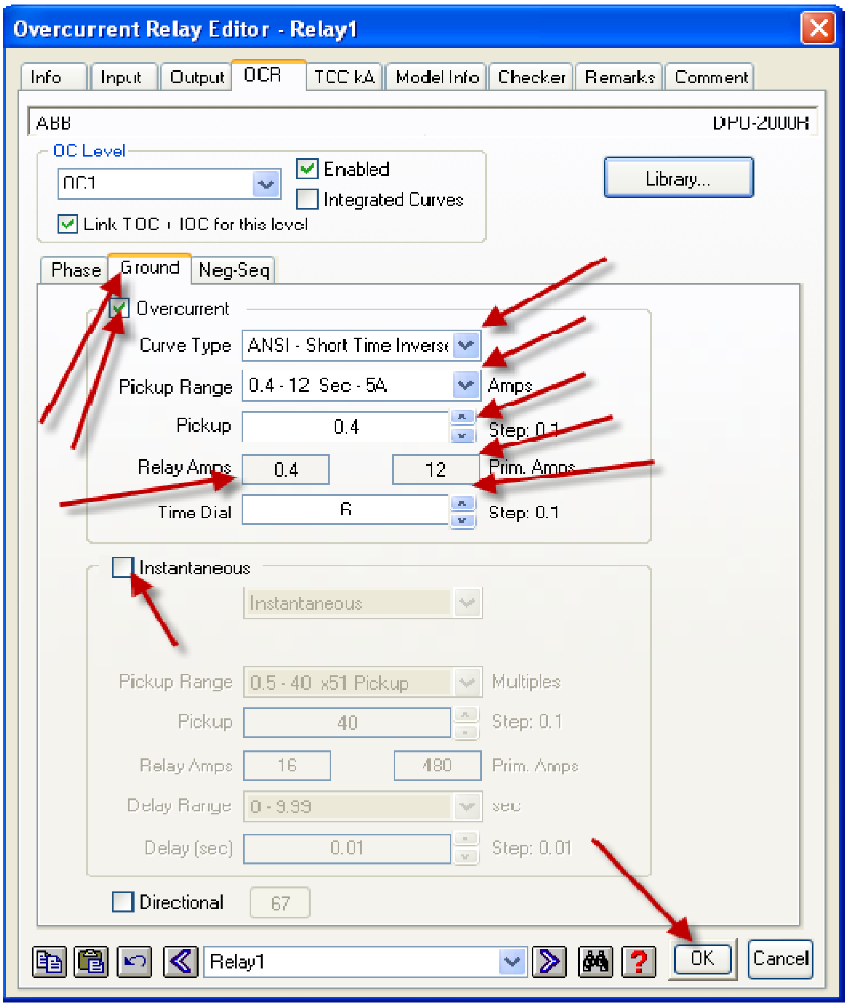
Relay1

This value will appear after connecting the current transformer

Fig 8-32

قم بالنقر على صفحة الارضي ثم قم بادخال المعطيات كما مبين ادناه ثم انقر موافق

Click on Ground TAB and enter the values as shown below.



Overcurrent Relay Editor - Relay1

ABB DPU-2000R

OC Level: OC1

☑ Enabled

☐ Integrated Curves

☑ Link TOC + IOC for this level

Phase | Ground | Neg-Seq

☑ Overcurrent

Curve Type: ANSI - Short Time Inverse

Pickup Range: 0.4 - 12 Sec - 5A Amps

Pickup: 0.4 Step: 0.1

Relay Amps: 0.4 12 Prim. Amps

Time Dial: 6 Step: 0.1

☐ Instantaneous

Instantaneous

Pickup Range: 0.5 - 40 x51 Pickup Multiples

Pickup: 40 Step: 0.1

Relay Amps: 16 480 Prim. Amps

Delay Range: 0 - 9.99 sec

Delay (sec): 0.01 Step: 0.01

☐ Directional 67

Relay1

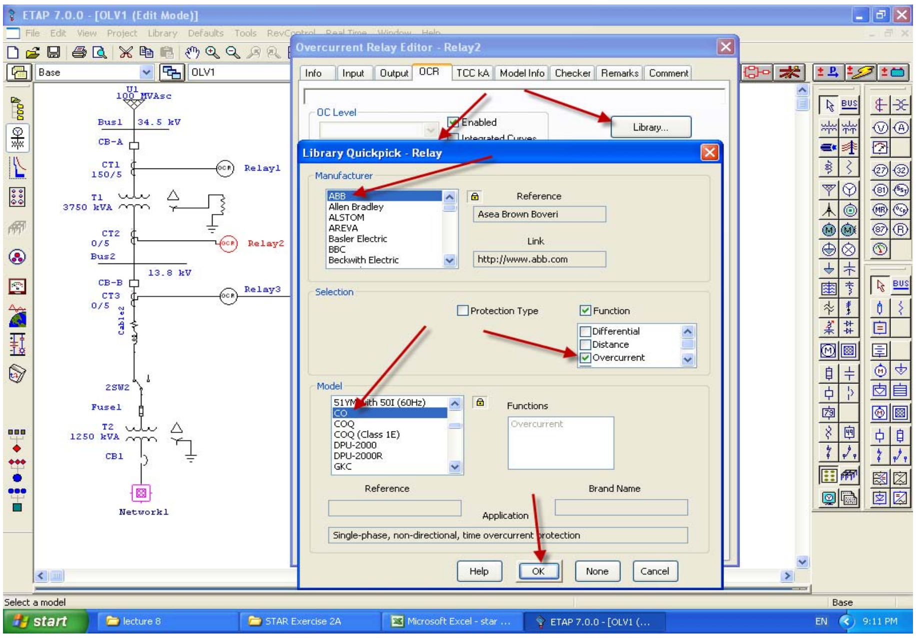
Info
Input
Output
OCR
TCC kA
Model Info
Checker
Remarks
Comment
Library...
OK
Cancel

Fig 8-33

افتح محرر المرحل 2 وادخل القيم في صفحة OCR.

انقر اولا على المكتبة لاختيار المرحل كما فعلنا سابقا ثم انقر موافق ثم ادخل القيم في المحرر كما مبين ادناه

Open relay 2 editor and insert the ratings in OCR TAB as shown below.
Click on the library to select the relay as we did before then click OK the insert the ratings in the editor as shown below.



Overcurrent Relay Editor - Relay2

☑ Enabled

Library Quickpick - Relay

Manufacturer: ABB

Reference: Asea Brown Boveri

Link: http://www.abb.com

Selection

☐ Protection Type ☑ Function

☐ Differential

☐ Distance

☑ Overcurrent

Model: CO

Functions: Overcurrent

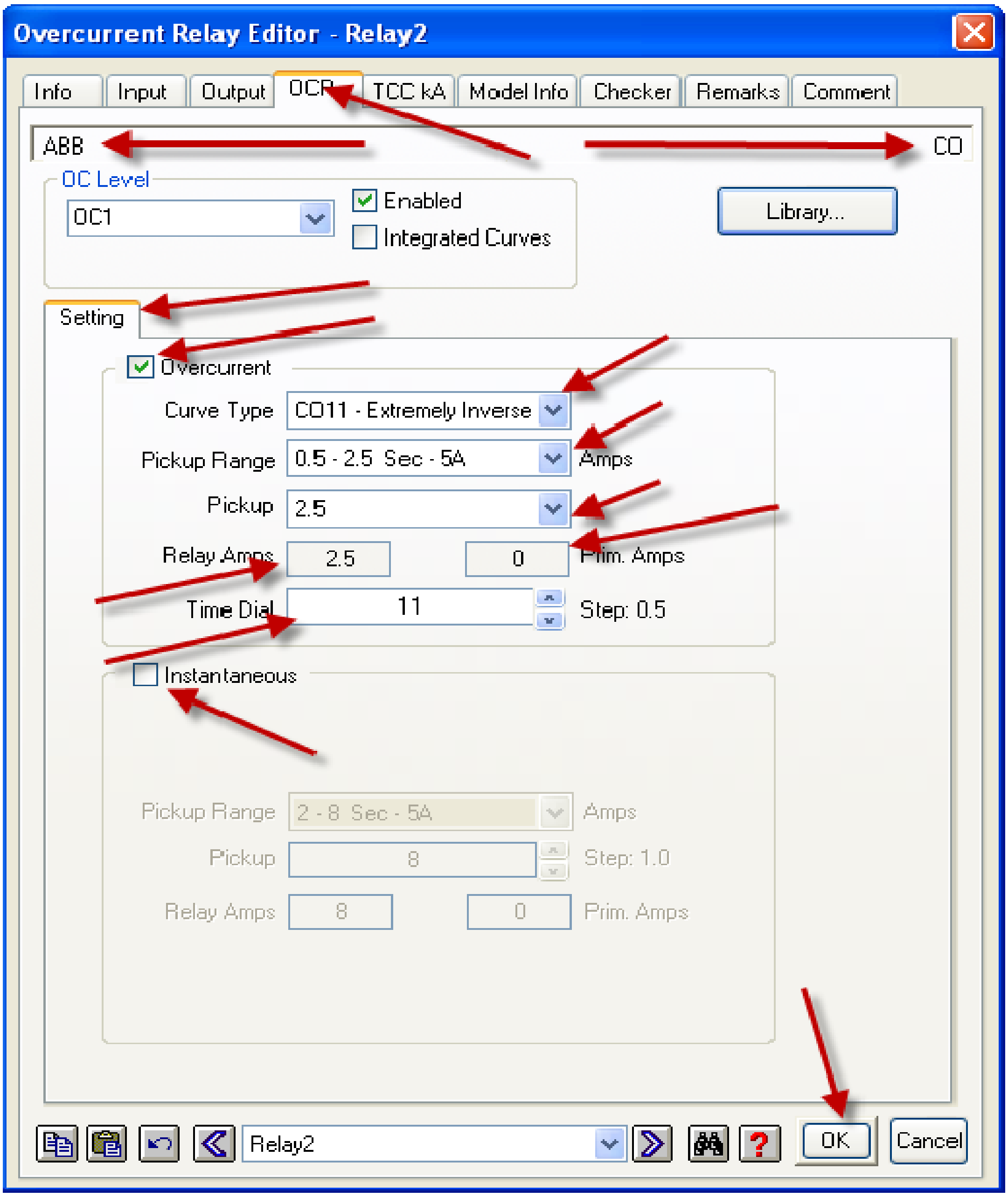
Application: Single-phase, non-directional, time overcurrent protection

ETAP 7.0.0 - [OLV1 (Edit Mode)]
Info
Input
Output
OCR
TCC kA
Model Info
Checker
Remarks
Comment
Library...
Allen Bradley
ALSTOM
AREVA
Basler Electric
BBC
Beckwith Electric
51YM with 50I (60Hz)
COQ
COQ (Class 1E)
DPU-2000
DPU-2000R
GKC
Reference
Brand Name
Help
OK
None
Cancel
Relay1
Relay2
Relay3
start
lecture 8
STAR Exercise 2A
Microsoft Excel - star ...
ETAP 7.0.0 - [OLV1 (...

Fig 8-34

بعد ادخال القيم يكون المحرر كما مبين ادناه, اضغط موافق

after inserting the ratings, the editor will be as shown below, click OK



Overcurrent Relay Editor - Relay2

Info
Input
Output
OCR
TCC kA
Model Info
Checker
Remarks
Comment
Library...
OK
Cancel

ABB CO

OC Level: OC1

☑ Enabled

☐ Integrated Curves

Setting

☑ Overcurrent

Curve Type: CO11 - Extremely Inverse

Pickup Range: 0.5 - 2.5 Sec - 5A Amps

Pickup: 2.5

Relay Amps: 2.5 — 0 Prim. Amps

Time Dial: 11 Step: 0.5

☐ Instantaneous

Pickup Range: 2 - 8 Sec - 5A Amps

Pickup: 8 Step: 1.0

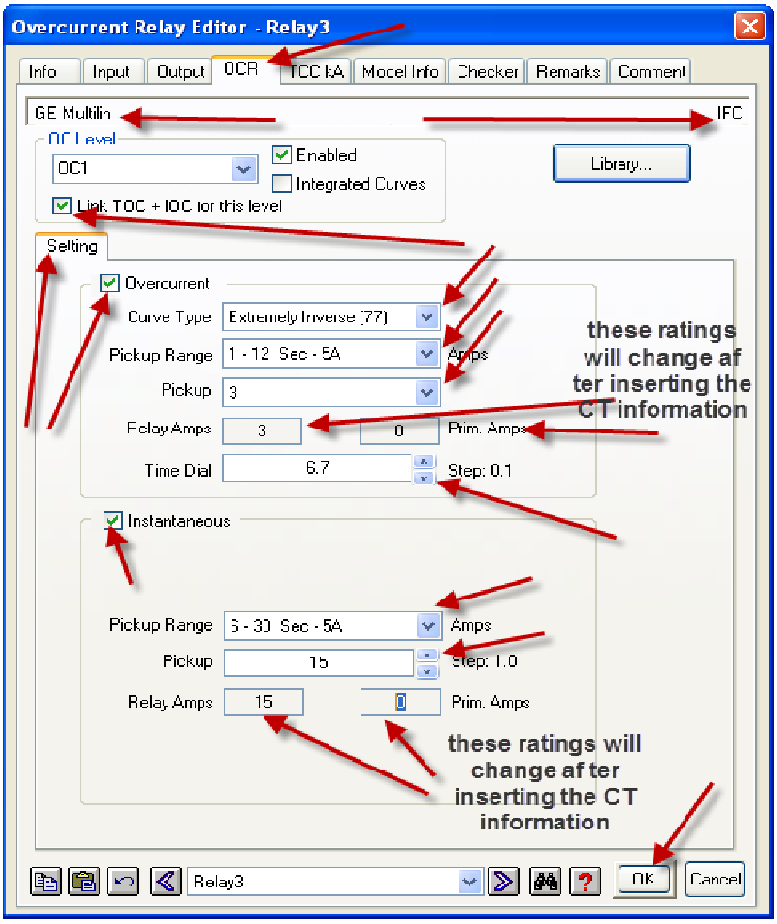
Relay Amps: 8 — 0 Prim. Amps

Relay2

Fig 8-35

كرر نفس الخطوات للمرحل 3 وسيكون كما مبين ادناه

repeat the same steps for relay 3 and it will be as shown below.



Overcurrent Relay Editor - Relay3

Info
Input
Output
OCR
TCC kA
Model Info
Checker
Remarks
Comment
Library...
Setting
OK
Cancel

GE Multilin — IFC

OC Level: OC1

☑ Enabled

☐ Integrated Curves

☑ Link TOC + IOC for this level

☑ Overcurrent

Curve Type: Extremely Inverse (77)

Pickup Range: 1 - 12 Sec - 5A Amps

Pickup: 3

Relay Amps: 3 — 0 Prim. Amps

Time Dial: 6.7 Step: 0.1

☑ Instantaneous

Pickup Range: 5 - 30 Sec - 5A Amps

Pickup: 15 Step: 1.0

Relay Amps: 15 — 0 Prim. Amps

Relay3

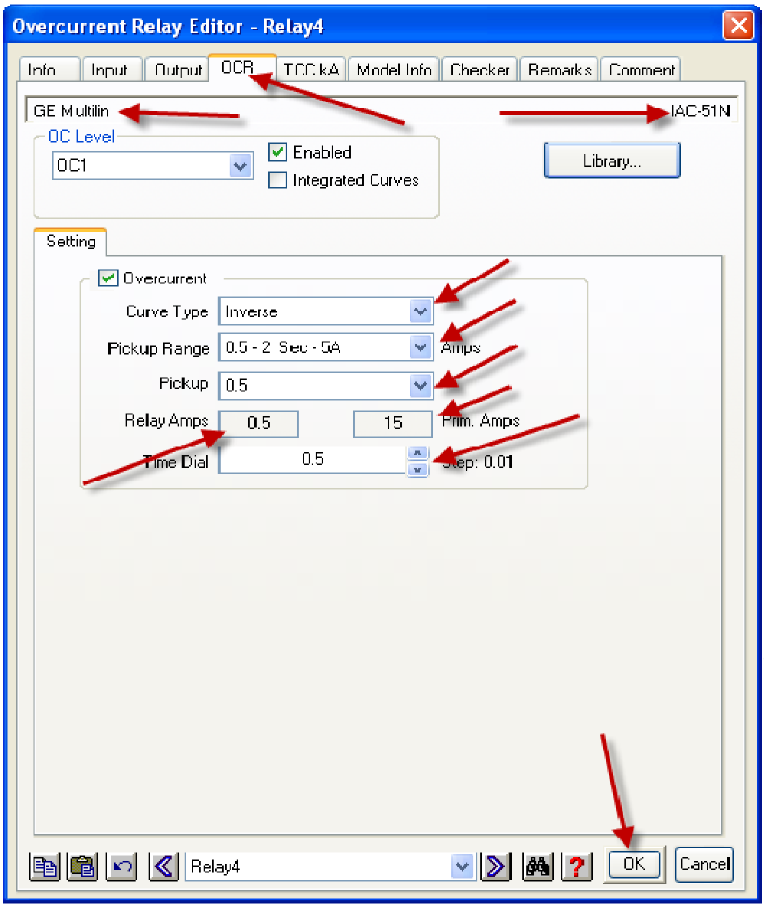
these ratings will change after inserting the CT information

these ratings will change after inserting the CT information

Fig 8-36

ادخل معلومات مرحل رقم 4

insert ratings for relay 4



Overcurrent Relay Editor - Relay4

Info
Input
Output
OCR
TCC kA
Model Info
Checker
Remarks
Comment
Library...
Setting
OK
Cancel

GE Multilin — IAC-51N

OC Level: OC1

☑ Enabled

☐ Integrated Curves

☑ Overcurrent

Curve Type: Inverse

Pickup Range: 0.5 - 2 Sec - 5A Amps

Pickup: 0.5

Relay Amps: 0.5 — 15 Prim. Amps

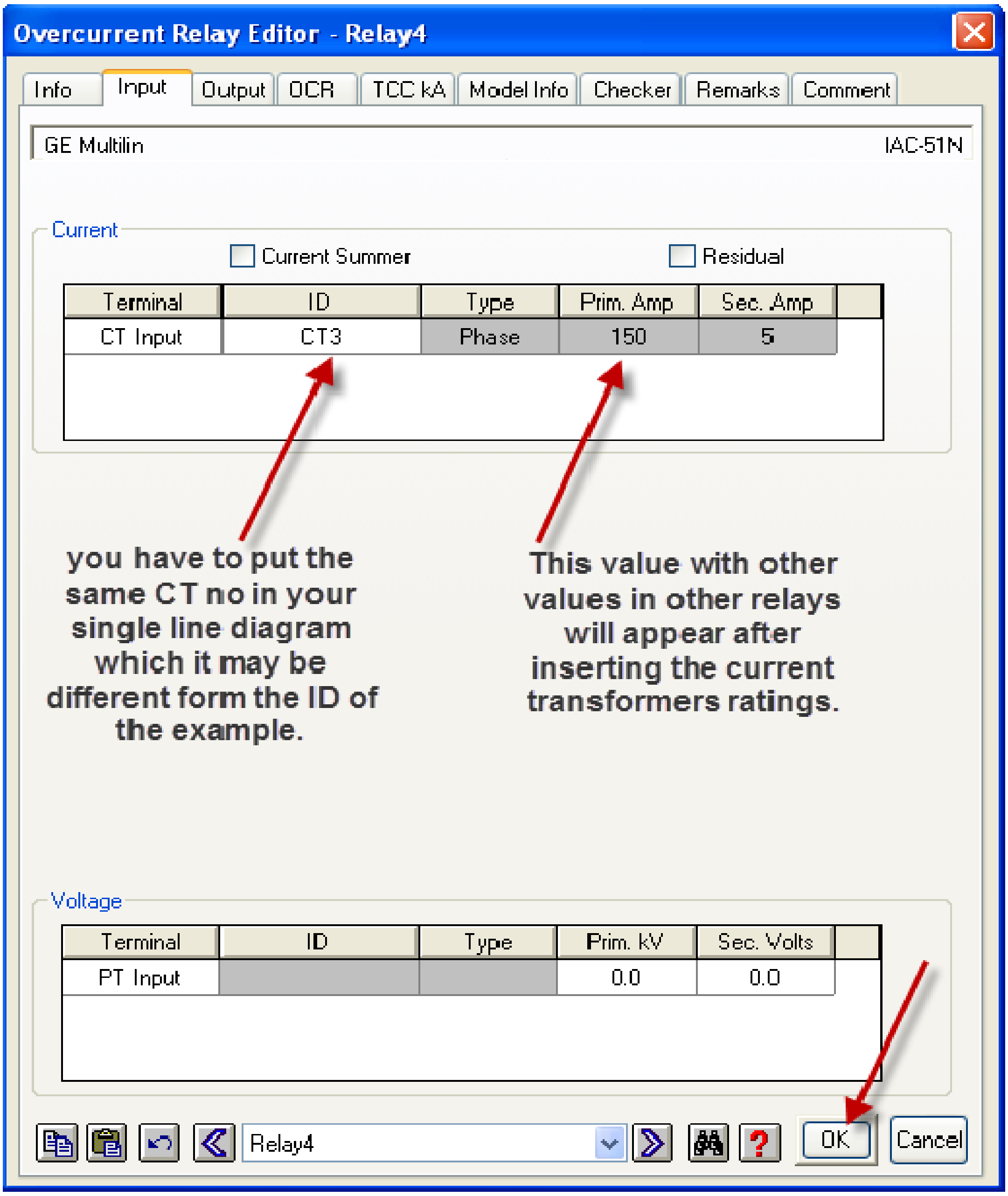
Time Dial: 0.5 Step: 0.01

Relay4

g 8-37

في مرحل 4 اذهب الى صفحة الادخال Input

in relay 4 editor, go to input TAB as shown below.


Overcurrent Relay Editor - Relay4
Info
Input
Output
OCR
TCC kA
Model Info
Checker
Remarks
Comment
OK
Cancel

GE Multilin IAC-51N

Current

☐ Current Summer ☐ Residual

Terminal	ID	Type	Prim. Amp	Sec. Amp
CT Input	CT3	Phase	150	5

you have to put the same CT no in your single line diagram which it may be different form the ID of the example.

This value with other values in other relays will appear after inserting the current transformers ratings.

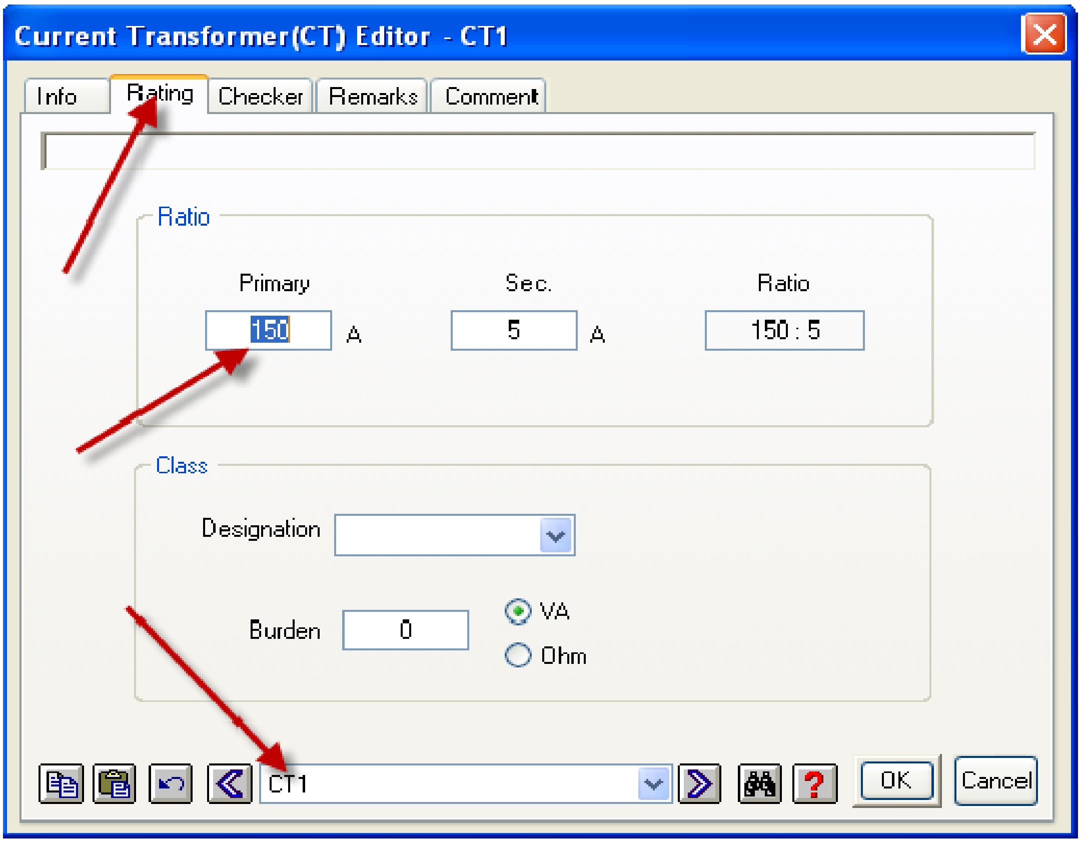
Voltage

Terminal	ID	Type	Prim. kV	Sec. Volts
PT Input			0.0	0.0

Relay4

Fig 8-38

افتح محرر محول التيار على صفحة rating ثم ادخل القيم كما مبين ادناه
open the CT editor in rating TAB and insert the ratings as shown below.



Current Transformer(CT) Editor - CT1

Ratio

Primary: 150 A

Sec.: 5 A

Ratio: 150 : 5

Class

Designation:

Burden: 0

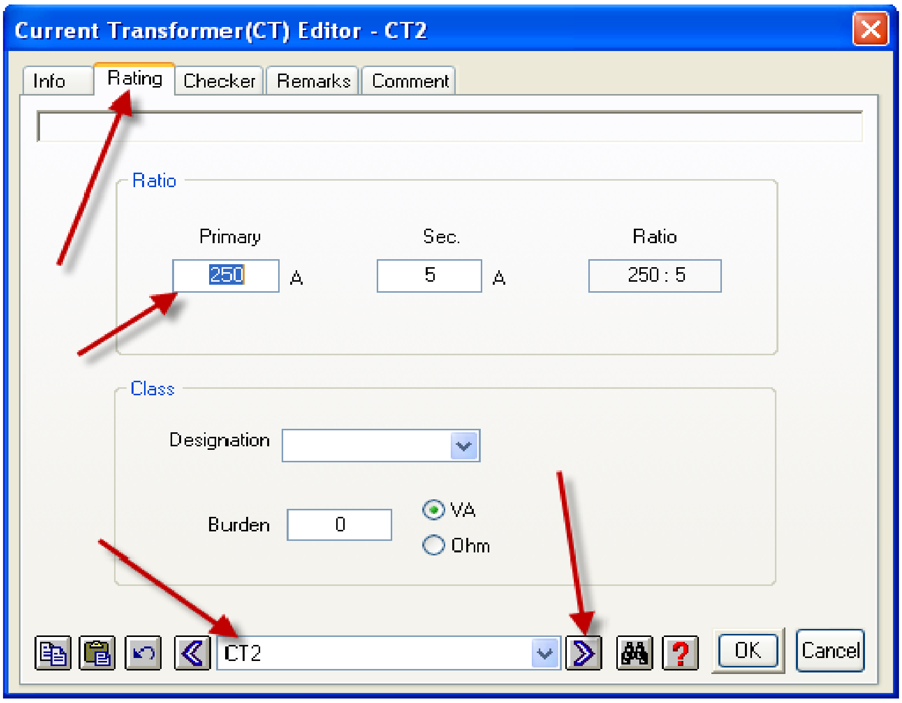
● VA
○ Ohm

CT1

Info
Rating
Checker
Remarks
Comment
OK
Cancel

Fig 8-39

اعد العملية للمحول 2 و3 (انتبه للقيم فهي غير متماثلة)
repeat the insertion for CT2 and CT3 (take care of the ratings as shown below)



Current Transformer(CT) Editor - CT2

Ratio

Primary: 250 A

Sec.: 5 A

Ratio: 250 : 5

Class

Designation:

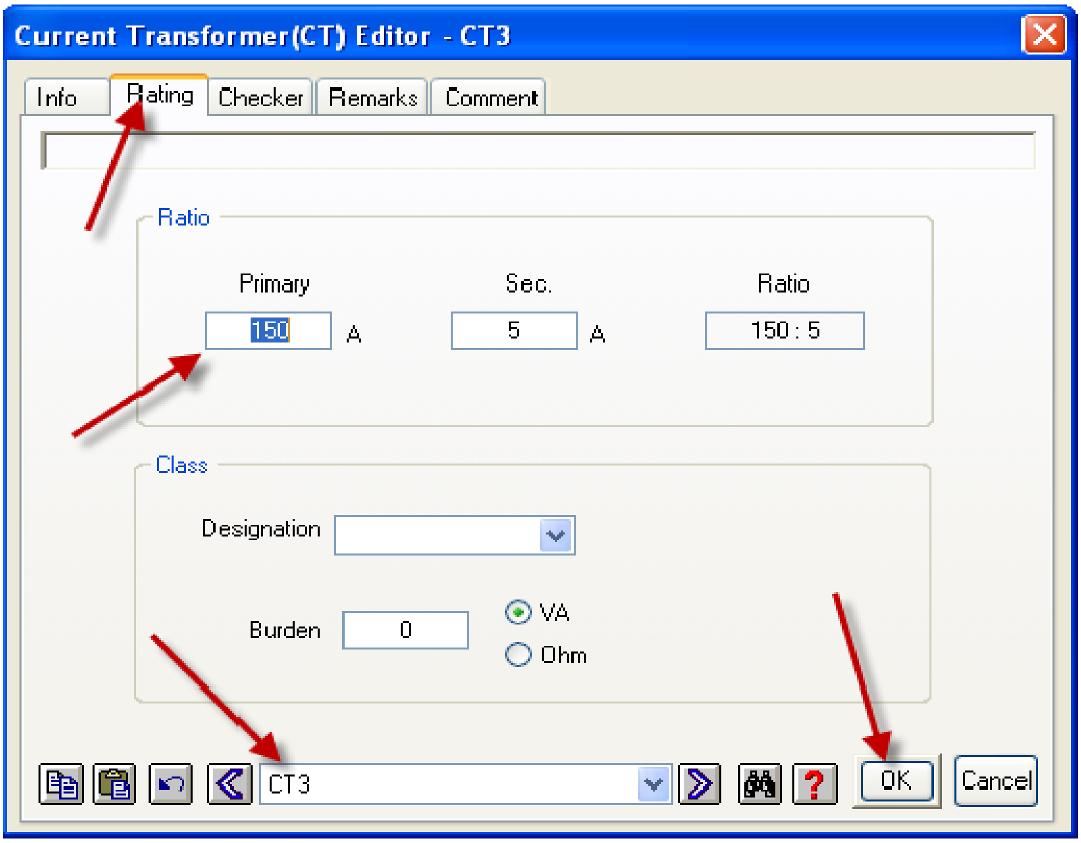
Burden: 0

● VA
○ Ohm

CT2

Info
Rating
Checker
Remarks
Comment
OK
Cancel

Fig 8-40


Current Transformer(CT) Editor - CT3
Info
Rating
Checker
Remarks
Comment
Ratio
Class
OK
Cancel

Primary 150 A

Sec. 5 A

Ratio 150 : 5

Designation

Burden 0

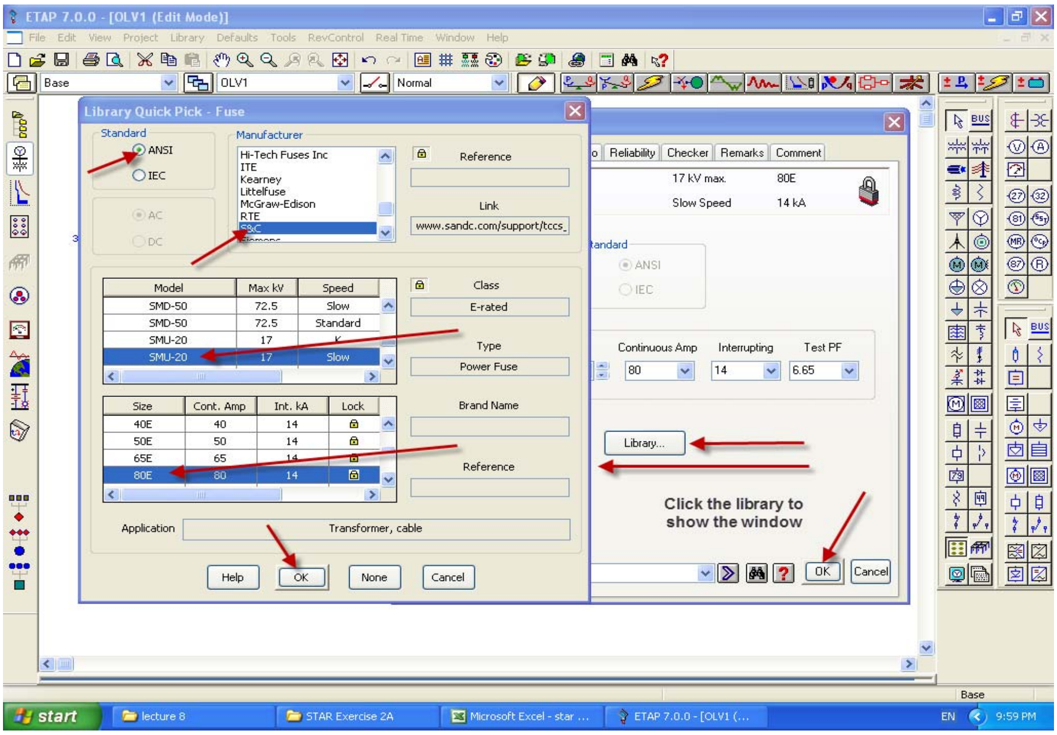
● VA
○ Ohm

CT3

Fig 8-41

افتح محرر المنصهر fuse 1 لادخال المعلومات كما مبين ادناه

open fuse 1 editor to enter the ratings. As shown below


ETAP 7.0.0 - [OLV1 (Edit Mode)]
File
Edit
View
Project
Library
Defaults
Tools
RevControl
Real Time
Window
Help
Base
OLV1
Normal
Library Quick Pick - Fuse
Reliability
Checker
Remarks
Comment
Library...
Help
OK
None
Cancel
start
lecture 8
STAR Exercise 2A
Microsoft Excel - star ...
ETAP 7.0.0 - [OLV1 (...
EN
9:59 PM

Standard
● ANSI
○ IEC

Manufacturer
Hi-Tech Fuses Inc
ITE
Kearney
Littelfuse
McGraw-Edison
RTE
S&C

Link www.sandc.com/support/tccs_

Model	Max kV	Speed
SMD-50	72.5	Slow
SMD-50	72.5	Standard
SMU-20	17	K
SMU-20	17	Slow

Class E-rated

Type Power Fuse

Size	Cont. Amp	Int. kA	Lock
40E	40	14	🔒
50E	50	14	🔒
65E	65	14	🔒
80E	80	14	🔒

Application Transformer, cable

17 kV max. 80E
Slow Speed 14 kA

Standard
● ANSI
○ IEC

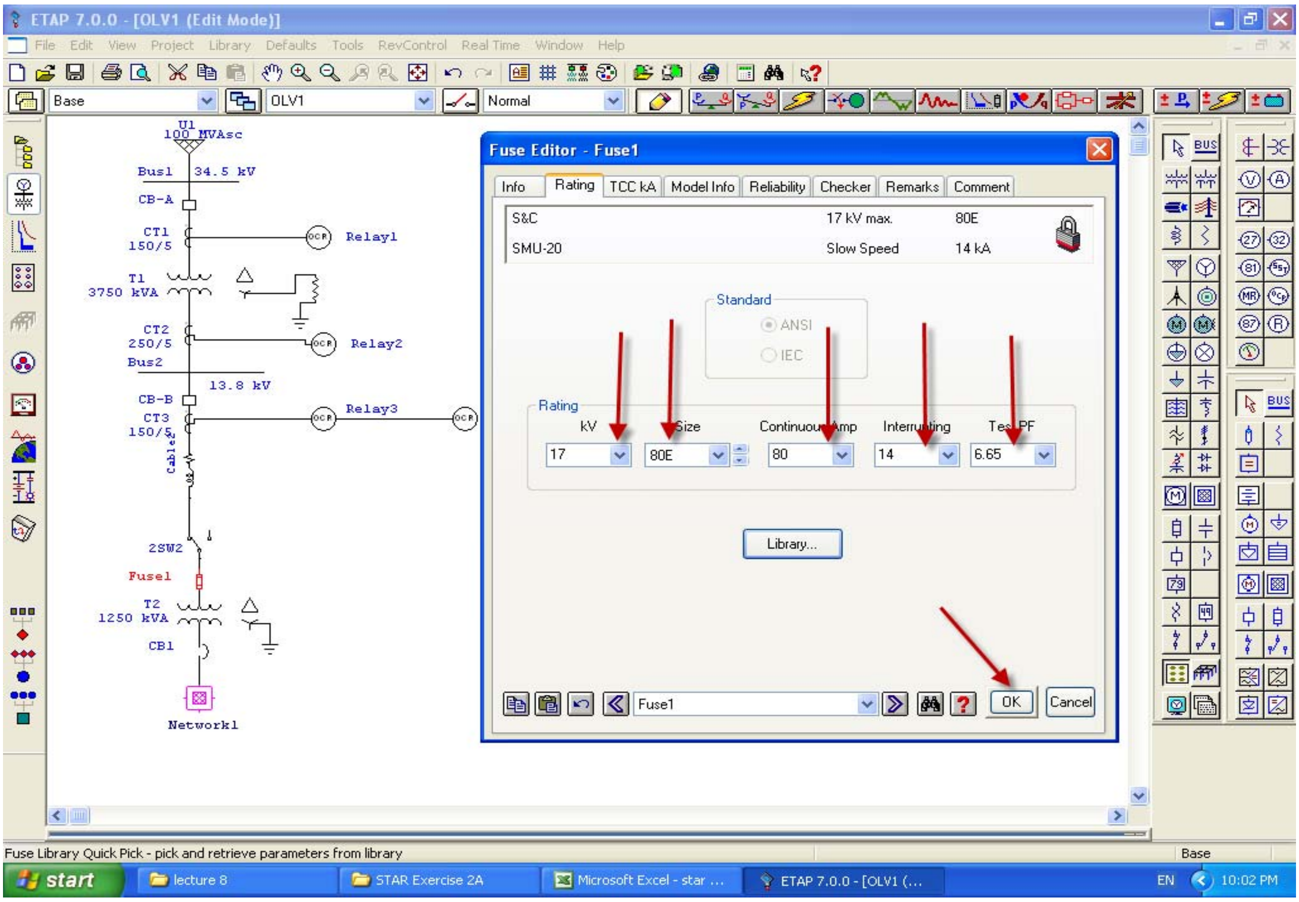
Continuous Amp 80
Interrupting 14
Test PF 6.65

Click the library to show the window

Fig 8-42

انقر على موافق للرجوع الى محرر المنصهر كما مبين ادناه

Click OK to returen back to the fuse editor as shown below



ETAP 7.0.0 - [OLV1 (Edit Mode)]

Fuse Editor - Fuse1

Info | Rating | TCC kA | Model Info | Reliability | Checker | Remarks | Comment

S&C 17 kV max. 80E

SMU-20 Slow Speed 14 kA

Standard: ● ANSI ○ IEC

Rating

kV: 17

Size: 80E

Continuous Amp: 80

Interrupting: 14

Test PF: 6.65

Library...

Fuse1

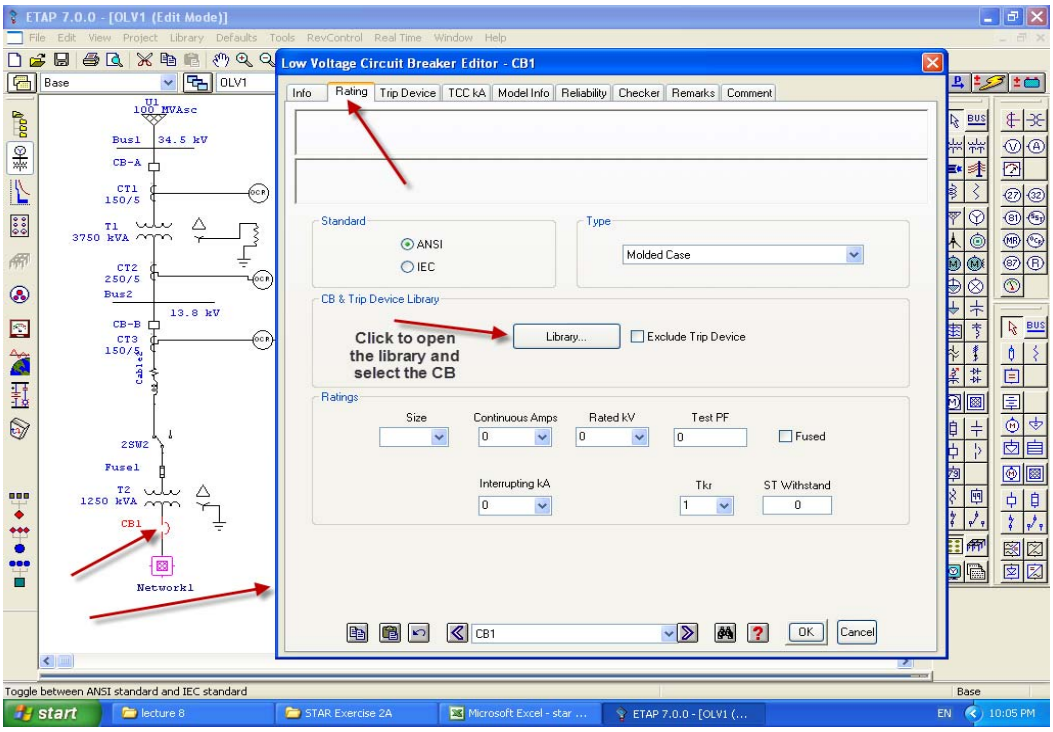
OK Cancel

Fuse Library Quick Pick - pick and retrieve parameters from library

File
Edit
View
Project
Library
Defaults
Tools
RevControl
Real Time
Window
Help
Base
OLV1
Normal
U1
100 MVAsc
Bus1
34.5 kV
CB-A
CT1
150/5
Relay1
T1
3750 kVA
CT2
250/5
Relay2
Bus2
13.8 kV
CB-B
CT3
150/5
Relay3
Cable
2SW2
Fuse1
T2
1250 kVA
CB1
Network1
start
lecture 8
STAR Exercise 2A
Microsoft Excel - star ...
ETAP 7.0.0 - [OLV1 (...
EN
10:02 PM

Fig 8-43

open the LV CB editor as shown belowl



ETAP 7.0.0 - [OLV1 (Edit Mode)]

Low Voltage Circuit Breaker Editor - CB1

Info | Rating | Trip Device | TCC kA | Model Info | Reliability | Checker | Remarks | Comment

Standard: ● ANSI ○ IEC

Type: Molded Case

CB & Trip Device Library

Click to open the library and select the CB

Library... ☐ Exclude Trip Device

Ratings

Size:

Continuous Amps: 0

Rated kV: 0

Test PF: 0

☐ Fused

Interrupting kA: 0

Tkr: 1

ST Withstand: 0

CB1

OK Cancel

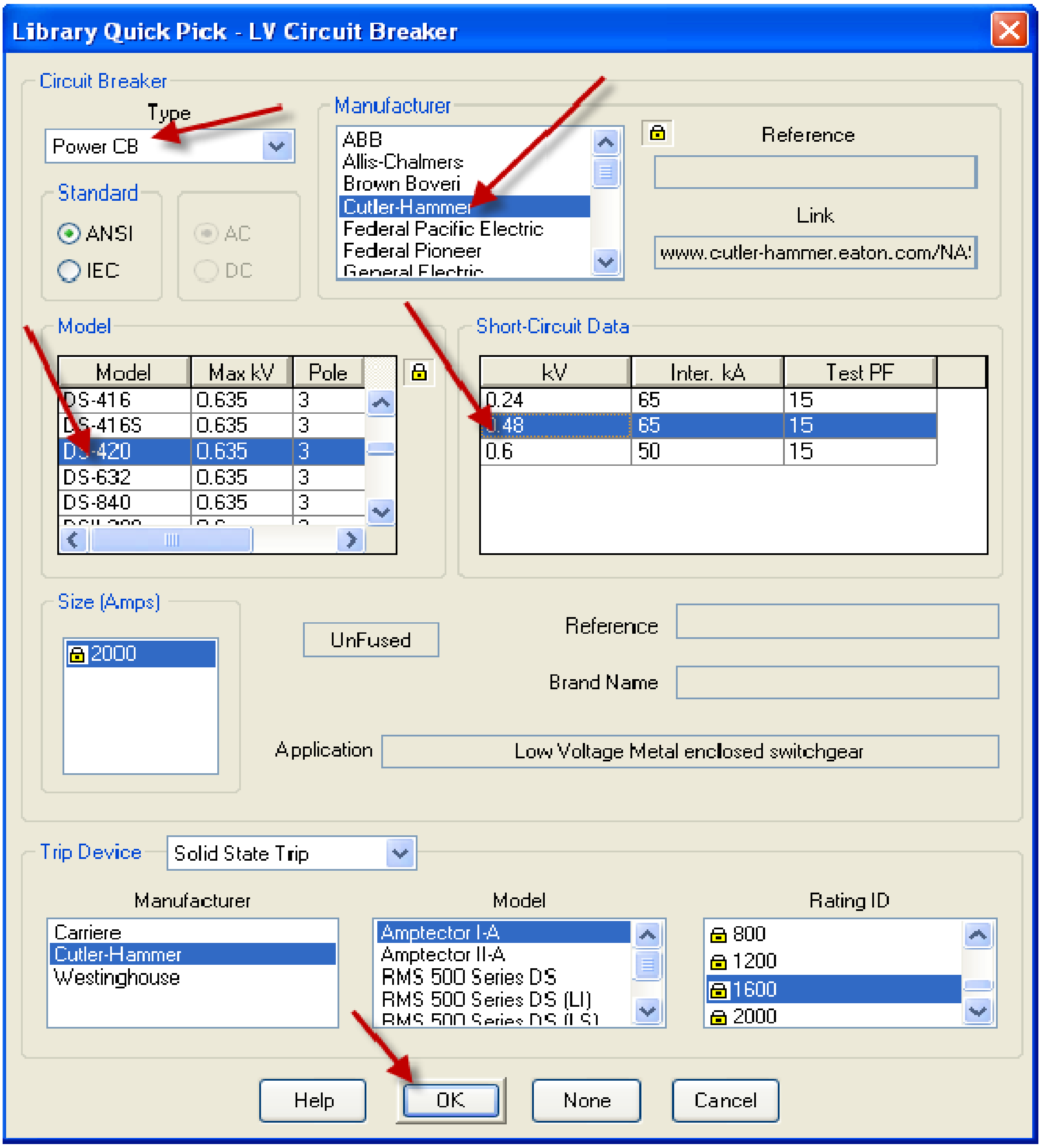
Toggle between ANSI standard and IEC standard

File
Edit
View
Project
Library
Defaults
Tools
RevControl
Real Time
Window
Help
Base
OLV1
U1
100 MVAsc
Bus1
34.5 kV
CB-A
CT1
150/5
T1
3750 kVA
CT2
250/5
Bus2
13.8 kV
CB-B
CT3
150/5
Cable
2SW2
Fuse1
T2
1250 kVA
CB1
Network1
start
lecture 8
STAR Exercise 2A
Microsoft Excel - star ...
ETAP 7.0.0 - [OLV1 (...
EN
10:05 PM

Fig 8-44

انقر على المكتبة لاختيار القاطع كما مبين ادناه

Click on the library to select the CB as shown below.



Library Quick Pick - LV Circuit Breaker

Circuit Breaker

Type: Power CB

Standard: ● ANSI ○ IEC

○ AC ○ DC

Manufacturer: ABB, Allis-Chalmers, Brown Boveri, Cutler-Hammer (selected), Federal Pacific Electric, Federal Pioneer, General Electric

Reference:

Link: www.cutler-hammer.eaton.com/NA!

Model

Model	Max kV	Pole
DS-416	0.635	3
DS-416S	0.635	3
DS-420	0.635	3
DS-632	0.635	3
DS-840	0.635	3

Short-Circuit Data

kV	Inter. kA	Test PF
0.24	65	15
0.48	65	15
0.6	50	15

Size (Amps): 2000

UnFused

Reference:

Brand Name:

Application: Low Voltage Metal enclosed switchgear

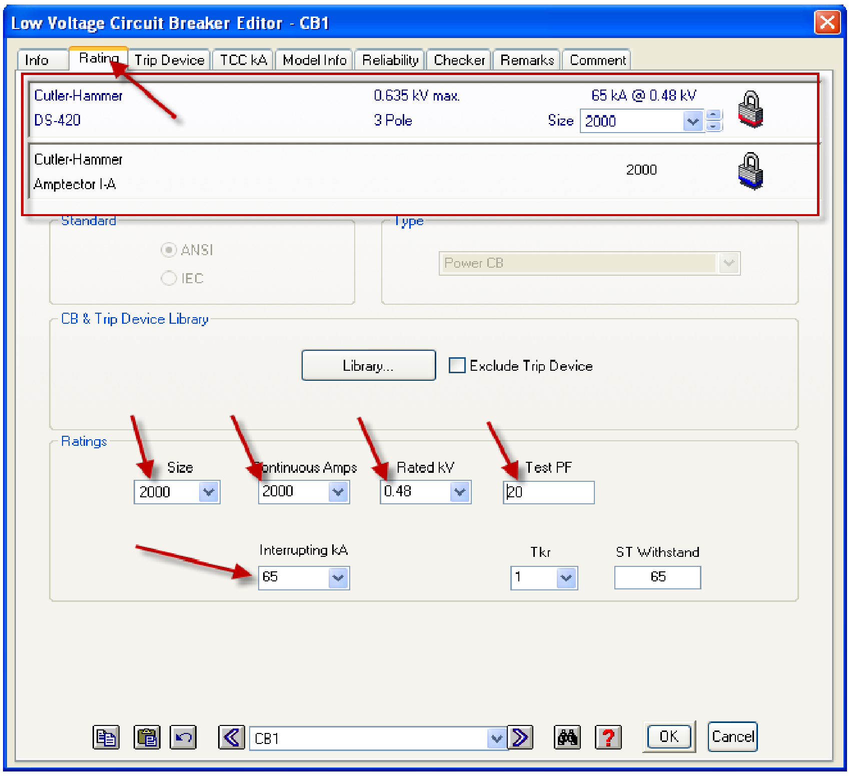
Trip Device: Solid State Trip

Manufacturer: Carriere, Cutler-Hammer (selected), Westinghouse

Model: Amptector I-A (selected), Amptector II-A, RMS 500 Series DS, RMS 500 Series DS (LI), RMS 500 Series DS (LS)

Rating ID: 800, 1200, 1600 (selected), 2000

Fig 8-45


Low Voltage Circuit Breaker Editor - CB1
Info
Rating
Trip Device
TCC kA
Model Info
Reliability
Checker
Remarks
Comment
Library...
OK
Cancel

Cutler-Hammer 0.635 kV max. 65 kA @ 0.48 kV
DS-420 3 Pole Size 2000

Cutler-Hammer 2000
Amptector I-A

Standard
● ANSI
○ IEC

Type
Power CB

CB & Trip Device Library
☐ Exclude Trip Device

Ratings
Size: 2000
Continuous Amps: 2000
Rated kV: 0.48
Test PF: 20
Interrupting kA: 65
Tkr: 1
ST Withstand: 65

CB1

Fig 8-46

اذهب الى صفحة trip device TAB في محرر القاطع وقم بادخال المعطيات حسب الاشكال ادناه

Go to trip device TAB in the CB editor and enter the ratings as shown below

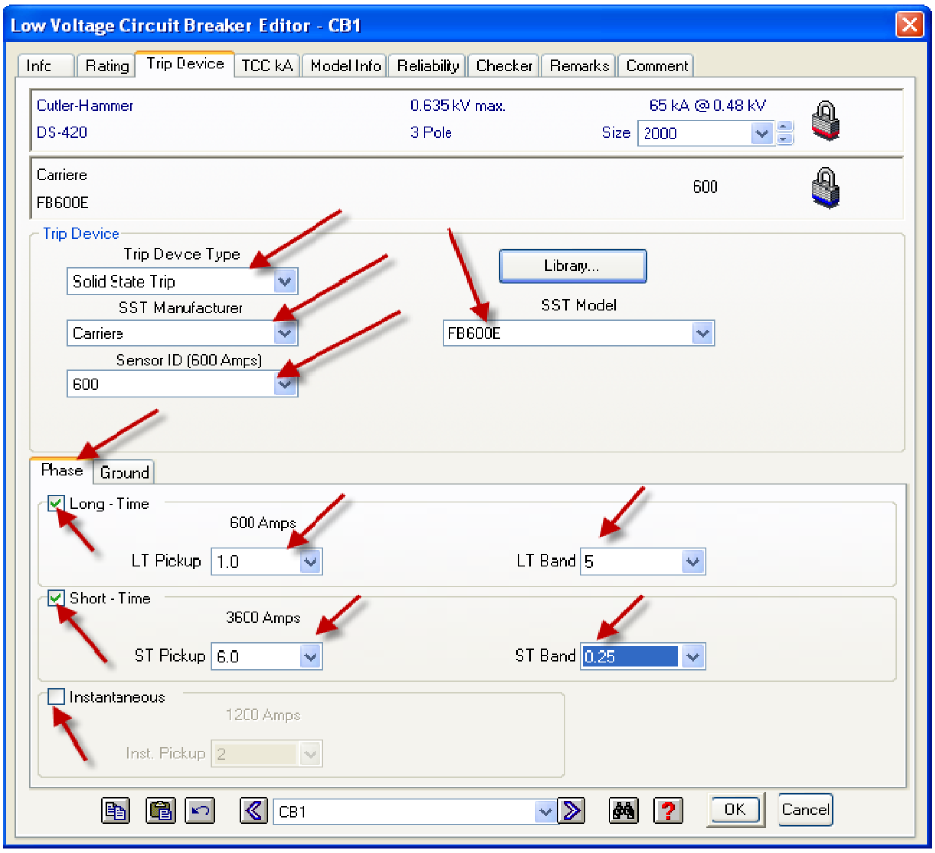

Low Voltage Circuit Breaker Editor - CB1
Info
Rating
Trip Device
TCC kA
Model Info
Reliability
Checker
Remarks
Comment
Library...
Phase
Ground
OK
Cancel

Fig 8-47

Cutler-Hammer 0.635 kV max. 65 kA @ 0.48 kV
DS-420 3 Pole Size 2000

Carriere 600
FB600E

Trip Device
Trip Devce Type: Solid State Trip
SST Manufacturer: Carriere
Sensor ID (600 Amps): 600
SST Model: FB600E

☑ Long - Time
600 Amps
LT Pickup: 1.0
LT Band: 5

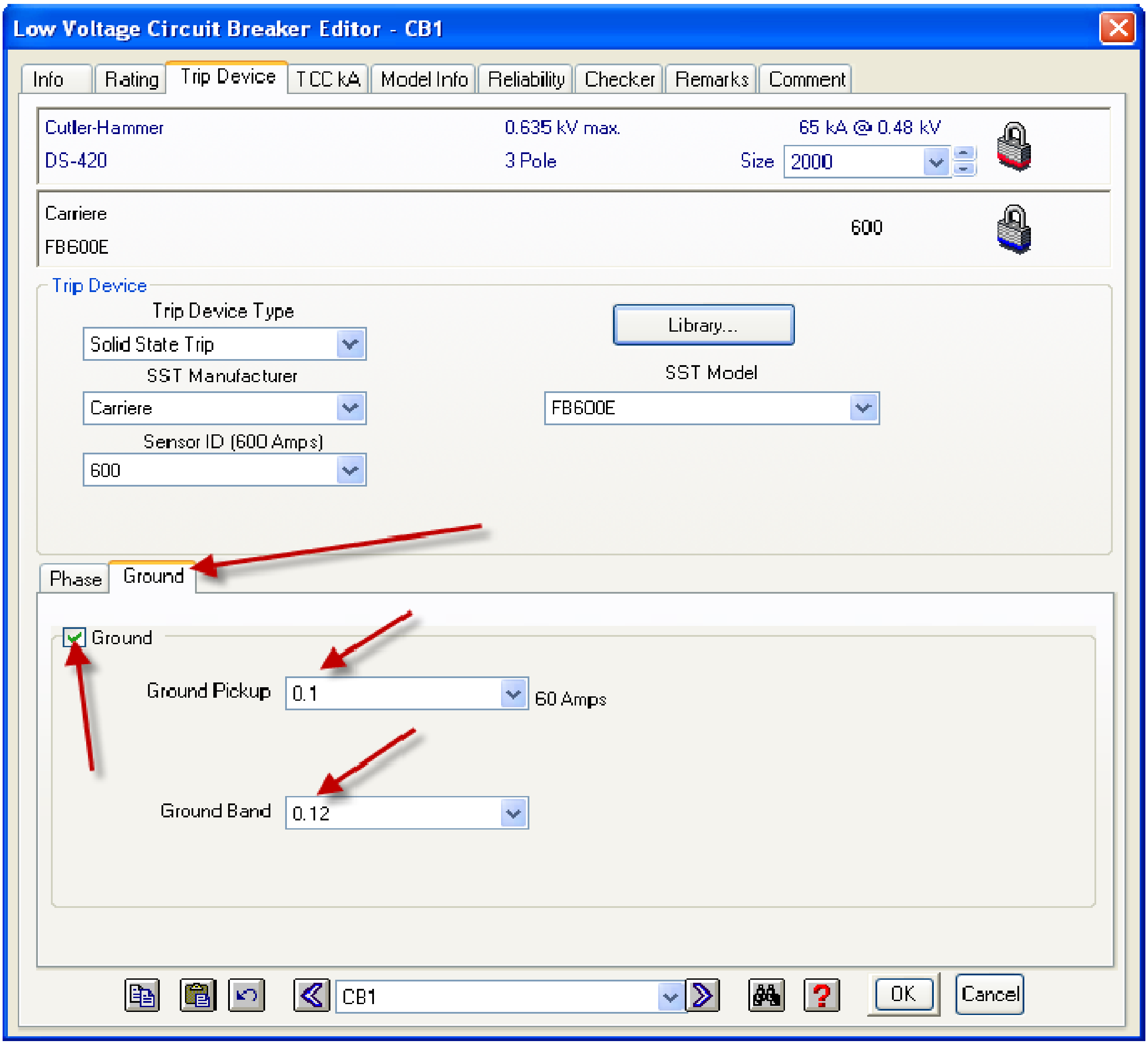
☑ Short - Time
3600 Amps
ST Pickup: 6.0
ST Band: 0.25

☐ Instantaneous
1200 Amps
Inst. Pickup: 2

CB1

انتقل في الجزء الاسفل الى صفحة ground وقم بادخال المعطيات حسب الشكل ادناه

go to the ground TAB down and insert the ratings as shown belowl.


Low Voltage Circuit Breaker Editor - CB1
Info
Rating
Trip Device
TCC kA
Model Info
Reliability
Checker
Remarks
Comment
Library...
Phase
Ground
OK
Cancel

Cutler-Hammer
DS-420
0.635 kV max.
3 Pole
65 kA @ 0.48 kV
Size 2000

Carriere
FB600E
600

Trip Device

Trip Device Type: Solid State Trip
SST Manufacturer: Carriere
Sensor ID (600 Amps): 600
SST Model: FB600E

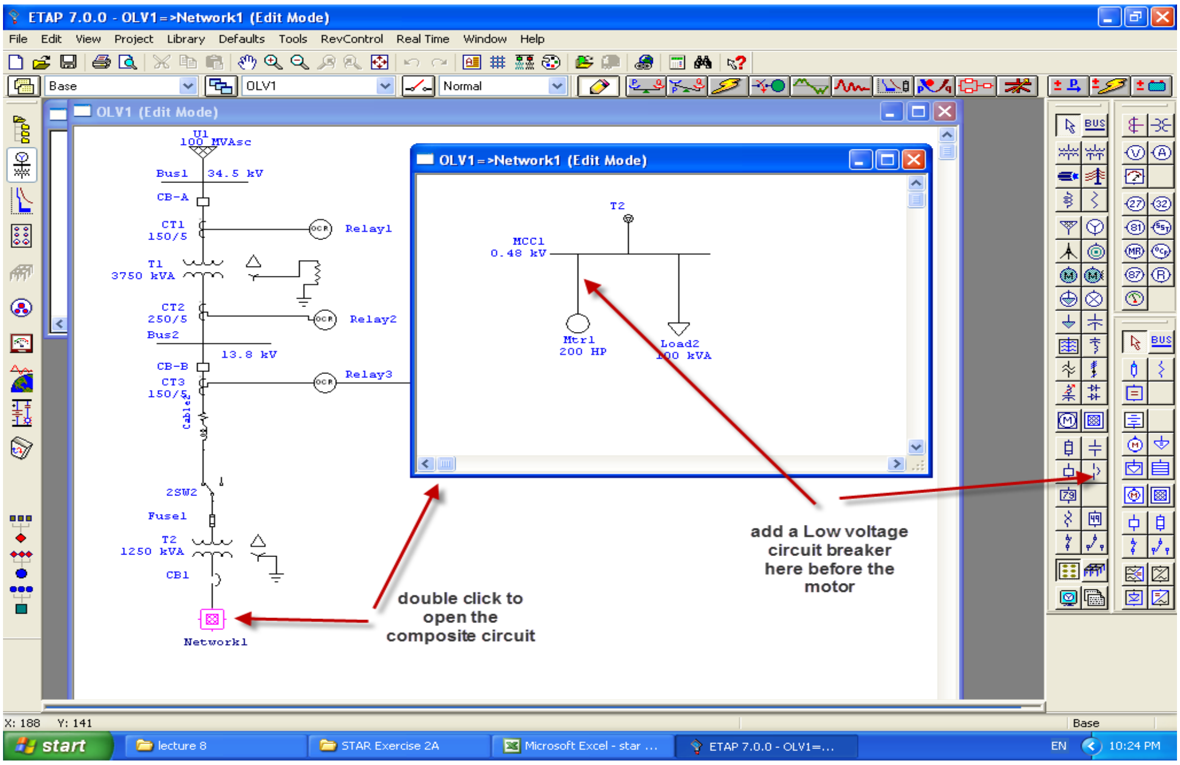
☑ Ground
Ground Pickup: 0.1 60 Amps
Ground Band: 0.12

CB1

Fig 8-48

قم باضافة قاطع دورة ضغط واطئ في الدائرة المركبة وكما مبين ادناه

Add a low voltage CB to the composite circuit as shwon below.


ETAP 7.0.0 - OLV1=>Network1 (Edit Mode)
File Edit View Project Library Defaults Tools RevControl Real Time Window Help
Base
OLV1
Normal
OLV1 (Edit Mode)
U1
100 MVAsc
Bus1
34.5 kV
CB-A
CT1
150/5
Relay1
T1
3750 kVA
CT2
250/5
Relay2
Bus2
13.8 kV
CB-B
CT3
150/5
Relay3
Cable
2SW2
Fuse1
T2
1250 kVA
CB1
Network1
OLV1=>Network1 (Edit Mode)
T2
MCC1
0.48 kV
Mtr1
200 HP
Load2
100 kVA
X: 188 Y: 141
Base
start
lecture 8
STAR Exercise 2A
Microsoft Excel - star ...
ETAP 7.0.0 - OLV1=...
EN
10:24 PM

add a Low voltage circuit breaker here before the motor

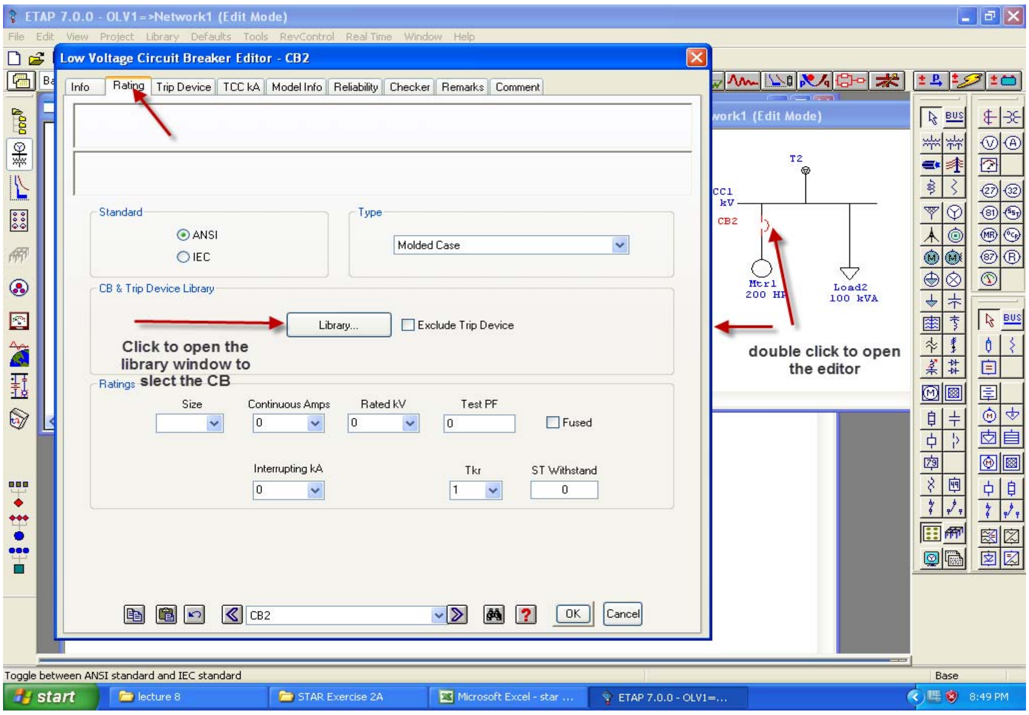
double click to open the composite circuit

Fig 8-49

سيكون الشكل كما مبين ادناه

افتح محرر قاطع الضغط الواطئ المضاف وكما مبين ادناه

the figure will be as shown belowl
open the added low voltage CB editor as shown belowl


ETAP 7.0.0 - OLV1=>Network1 (Edit Mode)
File Edit View Project Library Defaults Tools RevControl Real Time Window Help
Low Voltage Circuit Breaker Editor - CB2
Info
Rating
Trip Device
TCC kA
Model Info
Reliability
Checker
Remarks
Comment
Library...
OK
Cancel
work1 (Edit Mode)
T2
CC1
kV
CB2
Mtr1
200 HP
Load2
100 kVA
Base
start
lecture 8
STAR Exercise 2A
Microsoft Excel - star ...
ETAP 7.0.0 - OLV1=...
8:49 PM

Standard: ● ANSI ○ IEC

Type: Molded Case

CB & Trip Device Library: ☐ Exclude Trip Device

Ratings:

Size:
Continuous Amps: 0
Rated kV: 0
Test PF: 0
☐ Fused
Interrupting kA: 0
Tkr: 1
ST Withstand: 0

CB2

Toggle between ANSI standard and IEC standard

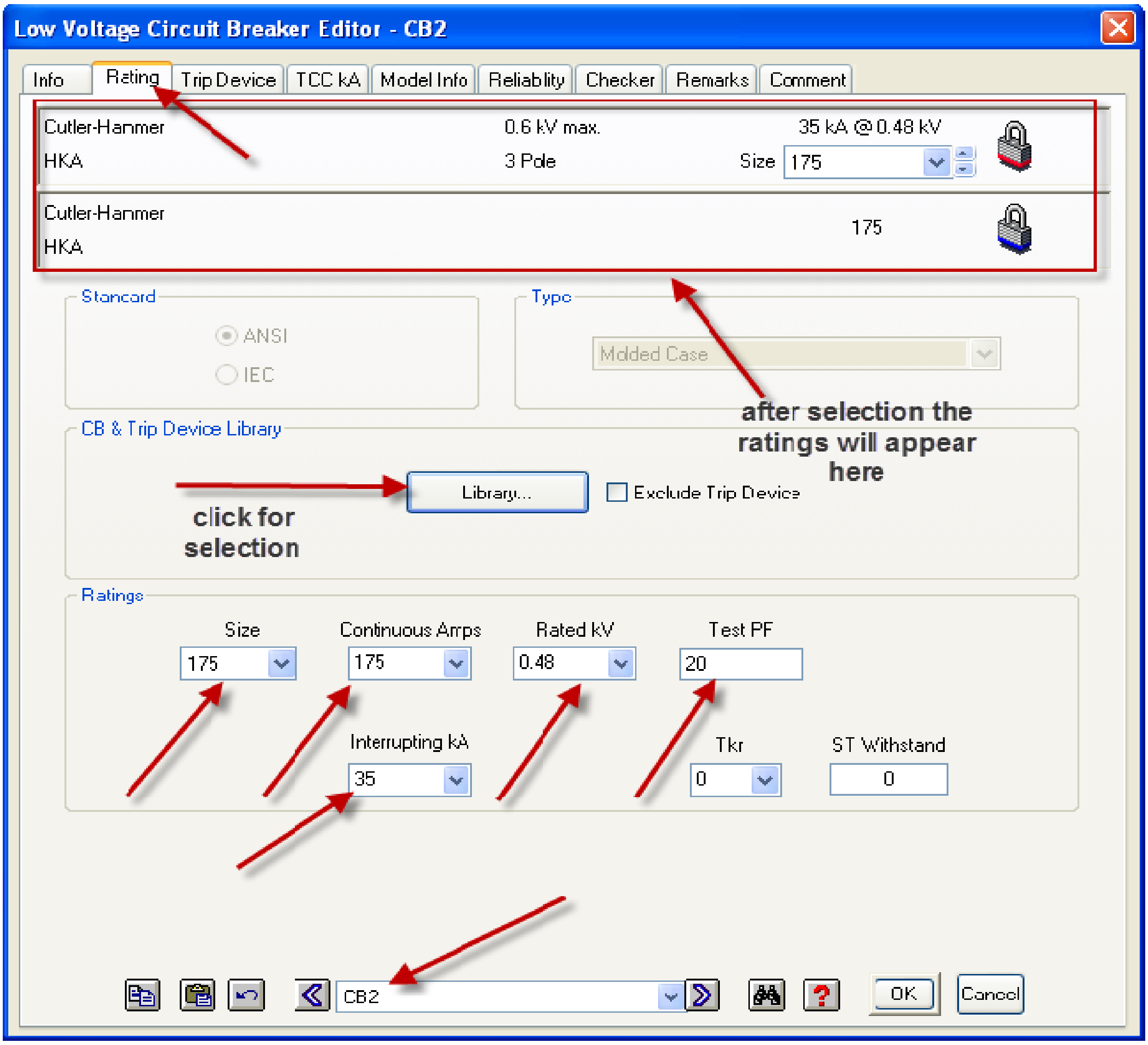
Click to open the library window to slect the CB

double click to open the editor

Fig 8-50

افتح المكتبة لاختيار القاطع كما مبين ادناه

open the libarary to select the CB as shown below.


Low Voltage Circuit Breaker Editor - CB2
Info
Rating
Trip Device
TCC kA
Model Info
Reliablity
Checker
Remarks
Comment
Library...
OK
Cancel

Cutler-Hammer HKA 0.6 kV max. 35 kA @ 0.48 kV
3 Pole Size 175

Cutler-Hammer HKA 175

Standard: ● ANSI ○ IEC

Type: Molded Case

after selection the ratings will appear here

CB & Trip Device Library

click for selection

☐ Exclude Trip Device

Ratings

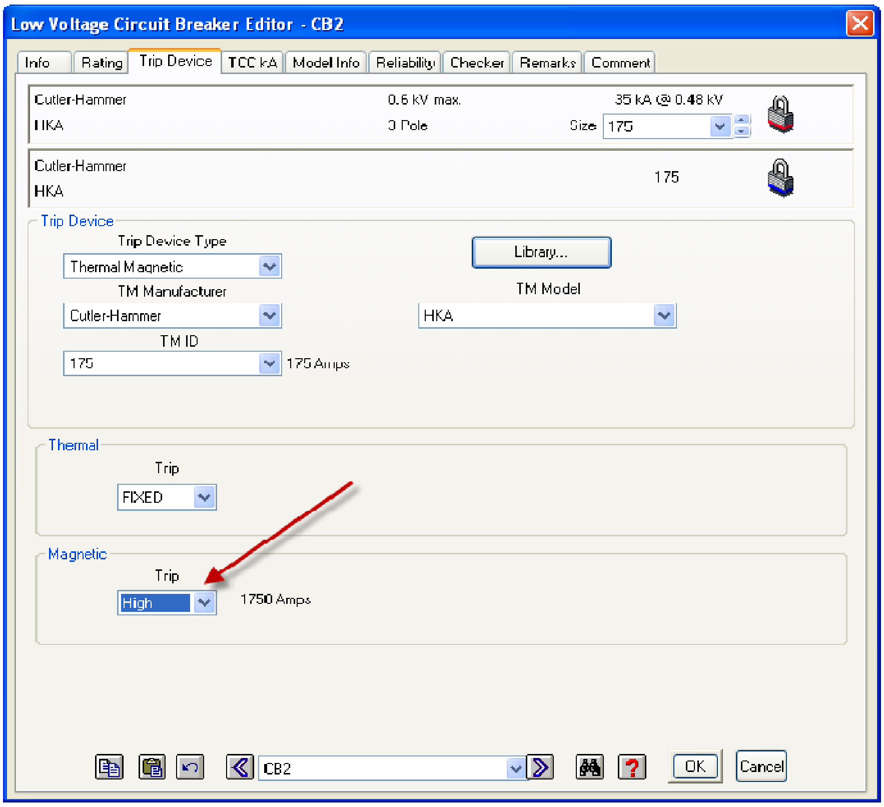
Size: 175
Continuous Amps: 175
Rated kV: 0.48
Test PF: 20
Interrupting kA: 35
Tkr: 0
ST Withstand: 0

CB2

Fig 8-51

اذهب الى صفحة TRIP DEVICE لاختيار الحماية كما مبين ادناه

Click on trip device TAB for protection selection as shown below.


Low Voltage Circuit Breaker Editor - CB2
Info
Rating
Trip Device
TCC kA
Model Info
Reliability
Checker
Remarks
Comment
Library...
OK
Cancel

Cutler-Hammer
HKA
0.6 kV max.
3 Pole
35 kA @ 0.48 kV
Size 175

Cutler-Hammer
HKA
175

Trip Device
Trip Device Type: Thermal Magnetic
TM Manufacturer: Cutler-Hammer
TM Model: HKA
TM ID: 175 175 Amps

Thermal
Trip: FIXED

Magnetic
Trip: High 1750 Amps

CB2

Fig 8-51

لغرض ضبط تسلسل العمل لقطع الحماية , نقوم بضبط التوصيل البيني للمرحل وكما مبين ادناه
انقر نقر مزدوج على المرحل 1 لاظهار المحرر ثم انتقل الى صفحة output وكما مبين ادناه

To set the sequence of operation, set the interlock for Relay 1 as shown below.
double click on Relay 1 and go to output TAB as shown below.

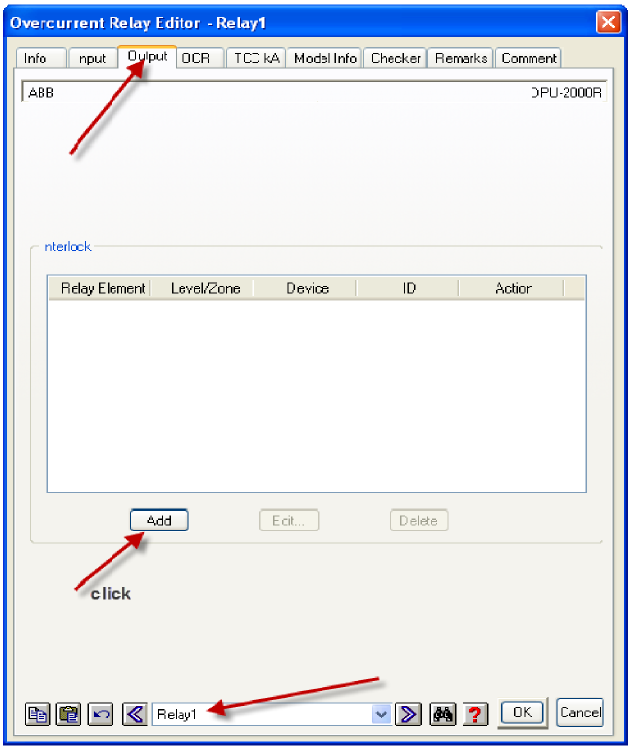

Overcurrent Relay Editor - Relay1
Info
Input
Output
OCR
TCC kA
Model Info
Checker
Remarks
Comment
Add
Edit...
Delete
click
OK
Cancel

ABB
DPU-2000R

Interlock

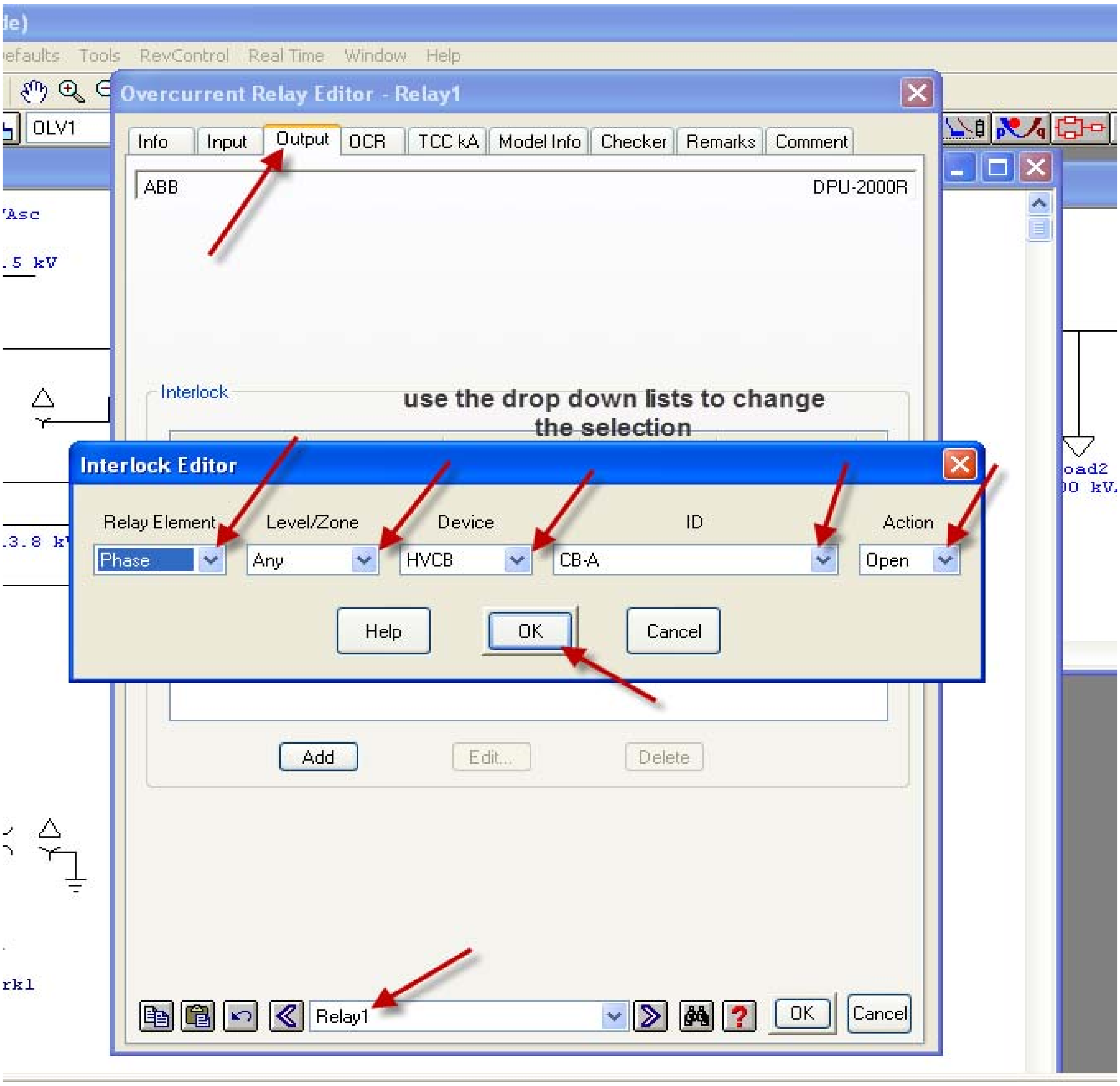
Relay Element	Level/Zone	Device	ID	Action

Relay1

Fig 8-52

انقر على add لاظهار النافذة الخاصة بالتوصيل البيني وادخل المعلومات ثم انقر موافق كما مبين ادناه

Click on add to show the interlock window and inter the data then click OK as shown below.


efaults
Tools
RevControl
Real Time
Window
Help
OLV1
Overcurrent Relay Editor - Relay1
Info
Input
Output
OCR
TCC kA
Model Info
Checker
Remarks
Comment
ABB
DPU-2000R
Interlock
Interlock Editor
Help
OK
Cancel
Add
Edit...
Delete
Relay1
OK
Cancel
Asc
.5 kV
.3.8 k
oad2
0 kV
rkl

use the drop down lists to change the selection

Relay Element: Phase
Level/Zone: Any
Device: HVCB
ID: CB-A
Action: Open

Fig 8-53

تحول الى المرحل 2 باستخدام الازرار اسفل المحرر الخاص بالمرحلات وادخل معلومات المرحل الثاني بنفس الطريقة وكما مبين ادناه

Switch to Relay2 by using the navigation buttons down the editor and entre the data in the same way to Relay 2 as shown below.

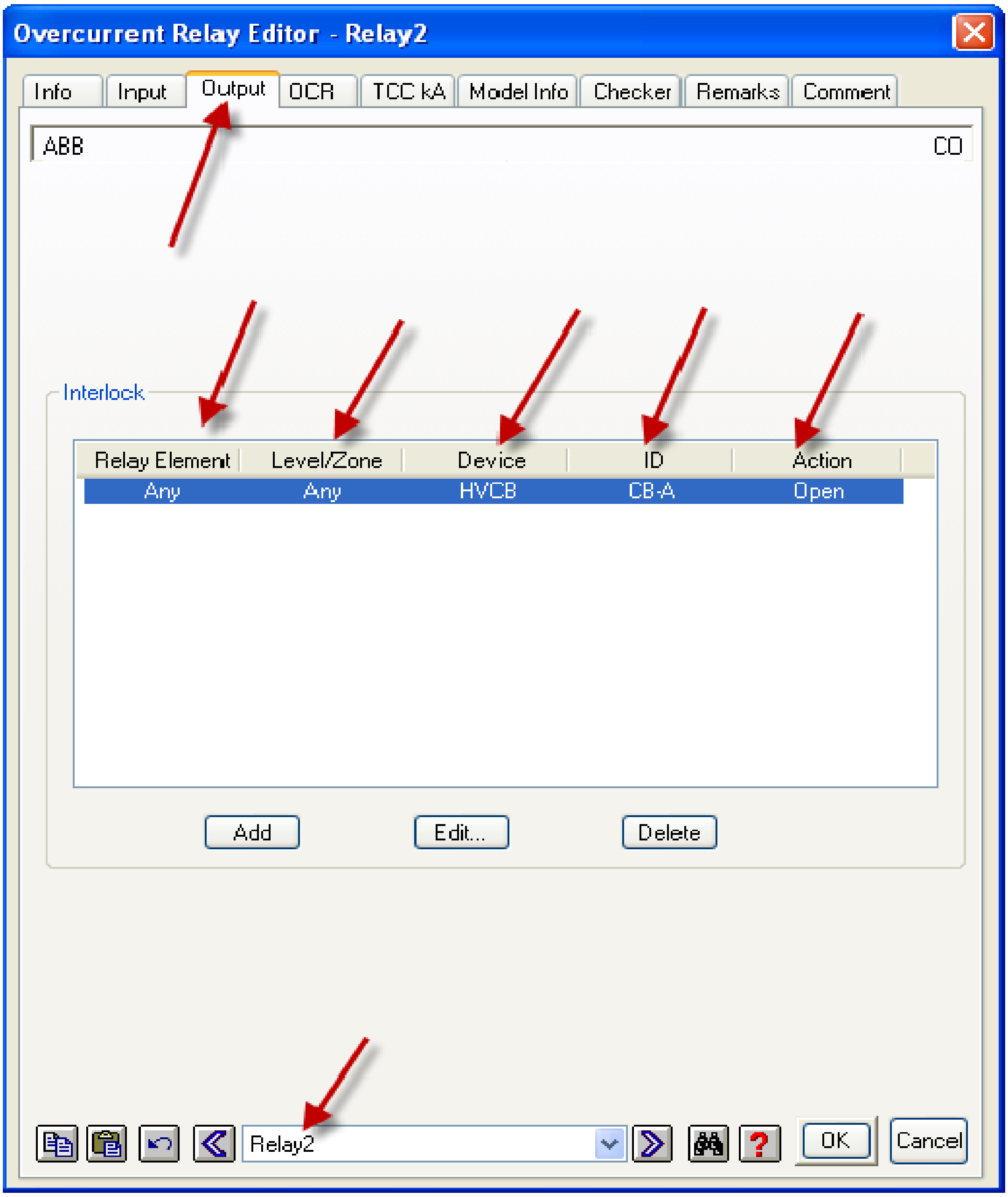

Overcurrent Relay Editor - Relay2
Info
Input
Output
OCR
TCC kA
Model Info
Checker
Remarks
Comment
Add
Edit...
Delete
OK
Cancel

ABB CO

Interlock

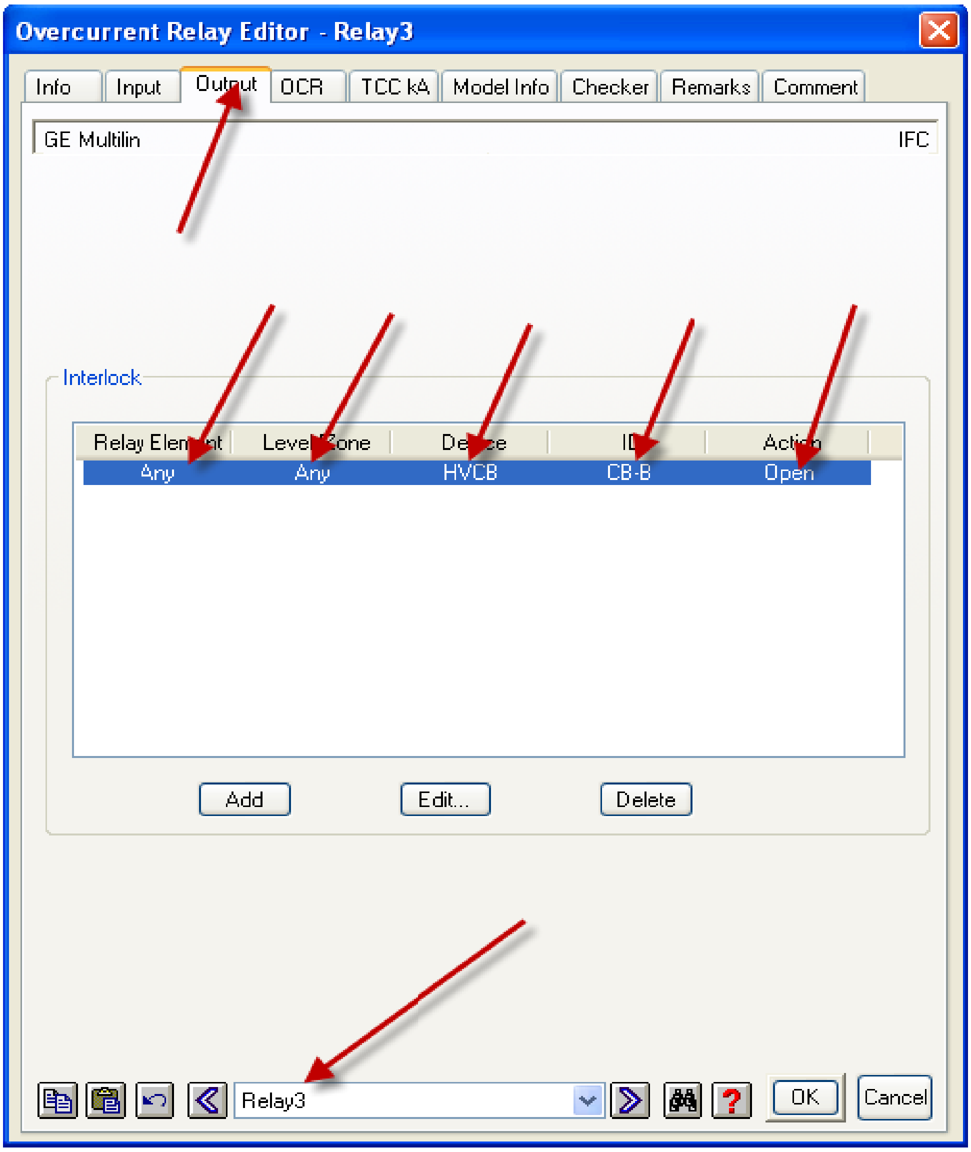
Relay Element	Level/Zone	Device	ID	Action
Any	Any	HVCB	CB-A	Open

Relay2

Fig 8-54

قم بنفس الخطوة للمرحلين 3 و 4 كما مبين ادناه

Do the same thing to Relay 3 and Relay 4 as shown below.



Overcurrent Relay Editor - Relay3

GE Multilin IFC

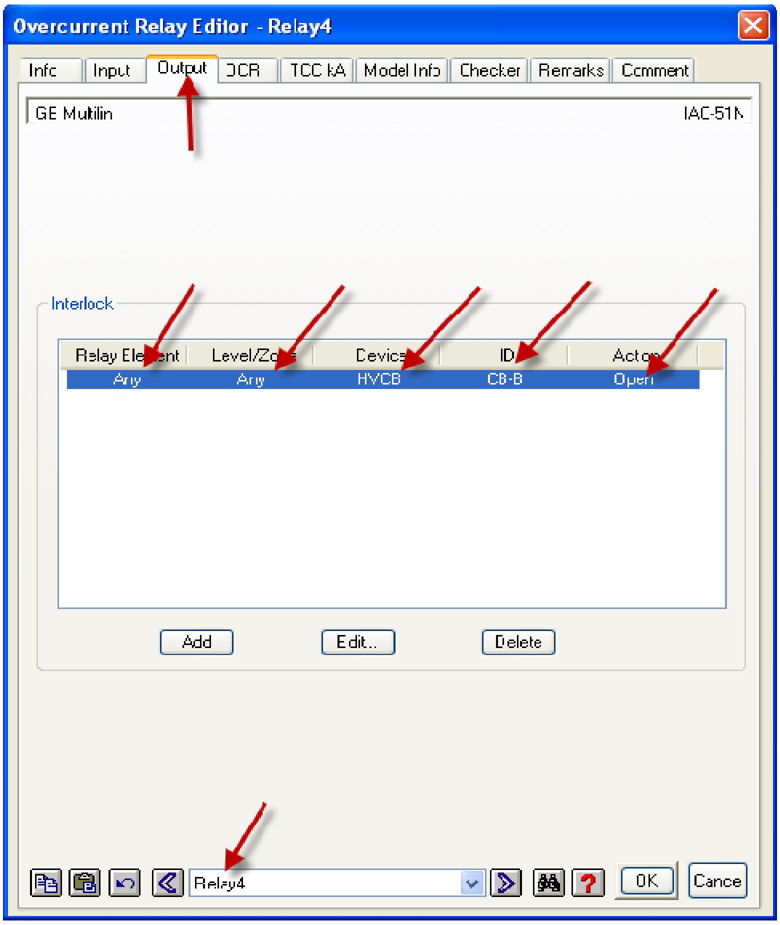
Interlock

Relay Element	Level/Zone	Device	ID	Action
Any	Any	HVCB	CB-B	Open

Relay3

Info
Input
Output
OCR
TCC kA
Model Info
Checker
Remarks
Comment
Add
Edit...
Delete
OK
Cancel

Fig 8-55


Overcurrent Relay Editor - Relay4
Info
Input
Output
OCR
TCC kA
Model Info
Checker
Remarks
Comment
Interlock
Add
Edit..
Delete
OK
Cancel

GE Multilin IAC-51N

Relay Element	Level/Zone	Device	ID	Action
Any	Any	HVCB	CB-B	Open

Relay4

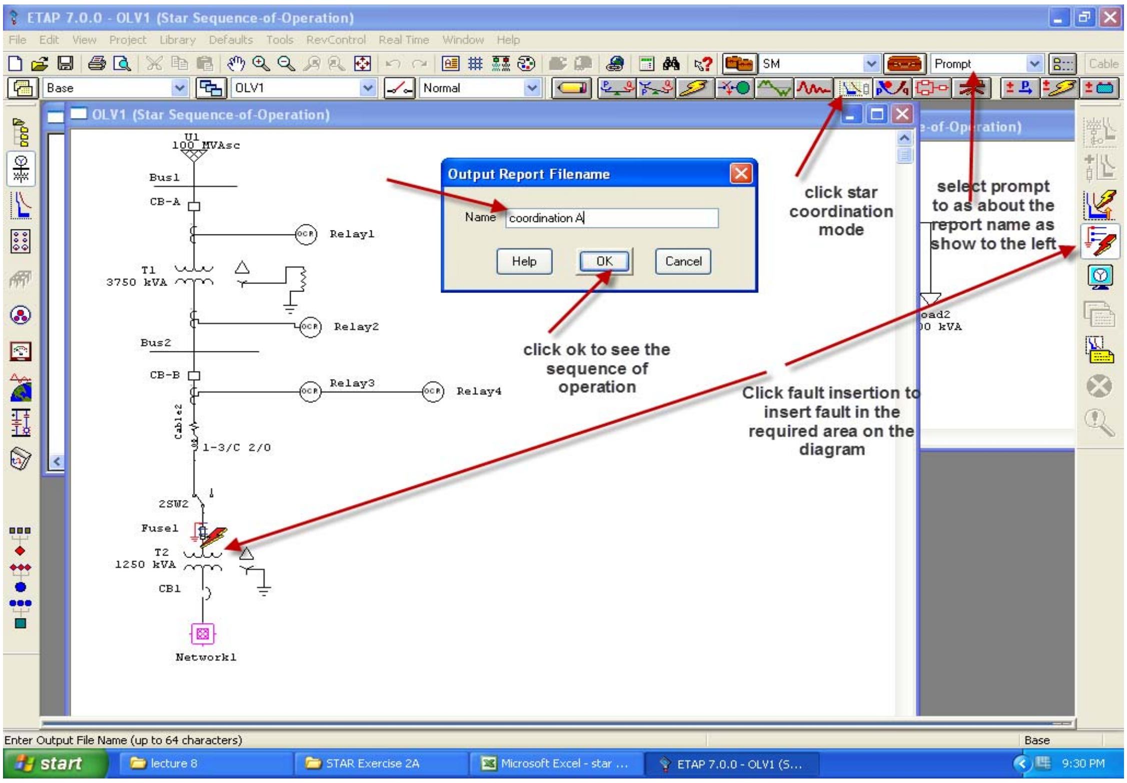
Fig 8-56

انقر على OK لاغلاق المحرر

Click on OK to close the editor

من شريط تنسيق STAR قم بوضع اشارة خلل ثلاثي الطور على ابتدائي المحول T4 كما مبين ادناه
اذا كانت القائمة المنزلقة للتقرير النهائي موضوعة على اختيار prompt فان البرنامج سوف يسال عن اسم التقرير لهذه العملية
ادخل اسم مناسب التقرير الاخراج ثم اضغط على موافق

From the Star coordination toolbar ,place a 3 phase fault on T4 primary as shown below.
If the drop down list of the output report is set on (prompet) then ETAP will ask about the output report name.
Select suitable name and clicl OK



ETAP 7.0.0 - OLV1 (Star Sequence-of-Operation)

Output Report Filename

Name: coordination A

click star coordination mode

select prompt to as about the report name as show to the left

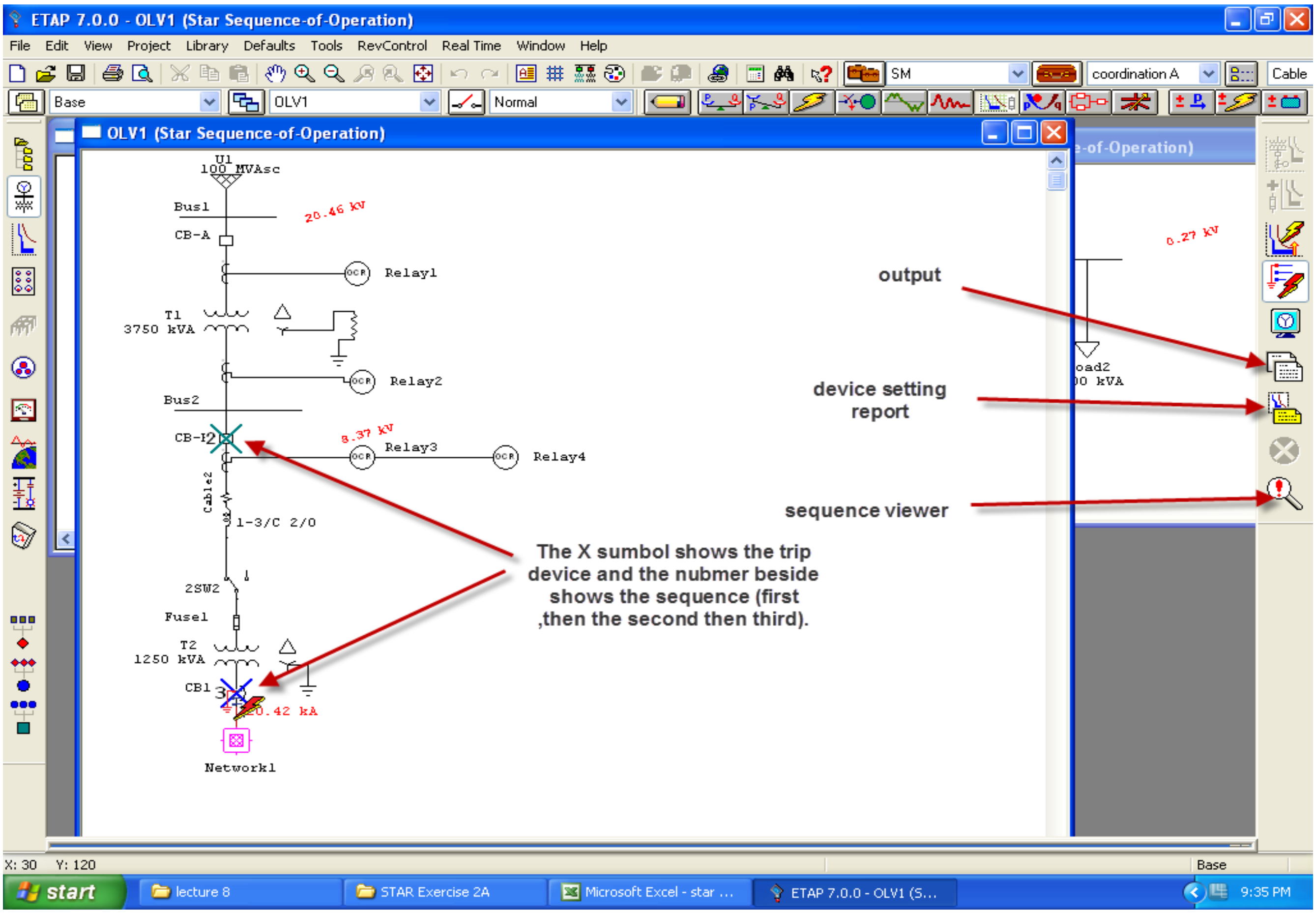
click ok to see the sequence of operation

Click fault insertion to insert fault in the required area on the diagram

Enter Output File Name (up to 64 characters)

File
Edit
View
Project
Library
Defaults
Tools
RevControl
Real Time
Window
Help
SM
Prompt
Cable
Base
OLV1
Normal
OLV1 (Star Sequence-of-Operation)
U1
100 MVAsc
Bus1
CB-A
Relay1
T1
3750 kVA
Relay2
Bus2
CB-B
Relay3
Relay4
Cable2
1-3/C 2/0
2SW2
Fuse1
T2
1250 kVA
CB1
Network1
Help
OK
Cancel
oad2
00 kVA
start
lecture 8
STAR Exercise 2A
Microsoft Excel - star ...
ETAP 7.0.0 - OLV1 (S...
9:30 PM

Fig 8-57



ETAP 7.0.0 - OLV1 (Star Sequence-of-Operation)

output

device setting report

sequence viewer

The X sumbol shows the trip device and the nubmer beside shows the sequence (first ,then the second then third).

File
Edit
View
Project
Library
Defaults
Tools
RevControl
Real Time
Window
Help
SM
coordination A
Cable
Base
OLV1
Normal
OLV1 (Star Sequence-of-Operation)
U1
100 MVAsc
Bus1
20.46 kV
CB-A
Relay1
T1
3750 kVA
Relay2
Bus2
CB-B
2
8.37 kV
Relay3
Relay4
Cable2
1-3/C 2/0
2SW2
Fuse1
T2
1250 kVA
CB1
3
20.42 kA
Network1
0.27 kV
oad2
00 kVA
X: 30
Y: 120
Base
start
lecture 8
STAR Exercise 2A
Microsoft Excel - star ...
ETAP 7.0.0 - OLV1 (S...
9:35 PM

Fig 8-58

في هذا التمرين اضفنا قطع الحماية ثم اضفنا التنسيق بينها واطلعنا على التسلسل الزمني الذي تعمل فيه قطع الحماية

in this exercise , we added the required relays and protections, then we established the interlock between them and finaly we saw the sequence of operation of the protection devices.